THE
ELECTRICAL REVIEW

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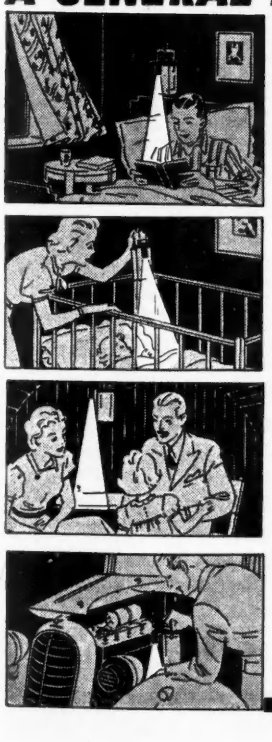

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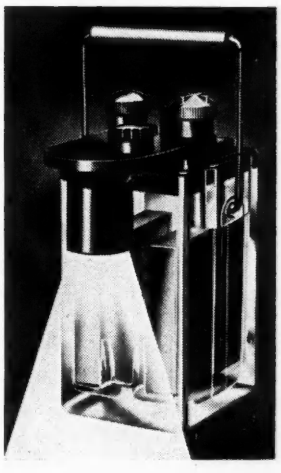

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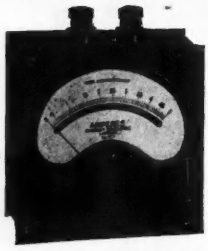

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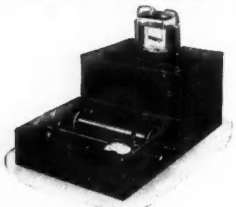

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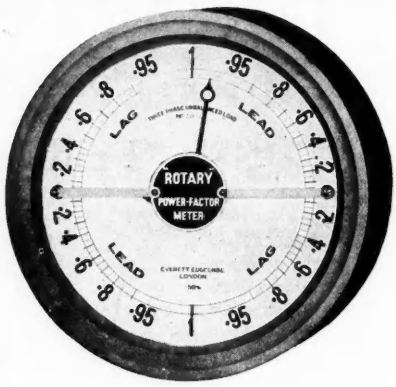

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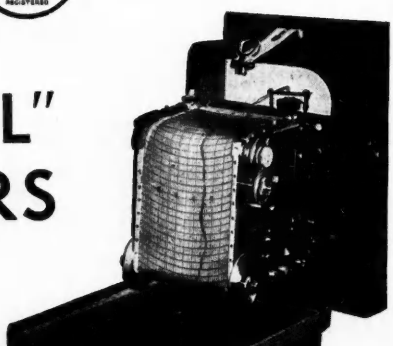

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Electricity Supply To-day

The Industry and Wartime Needs

THERE must inevitably be an air of unreality in these grave days about anything which is not directly contributing to the winning of the war. It is true to say, however, that the electrical industry is a vital factor in our war effort, assisting very largely in the production of supplies and in maintaining the life of the nation. Moreover, it is able to serve to a far greater extent than has yet been achieved.

This is our justification for bringing together the series of articles, of interest primarily to the electricity supply engineer and administrator, which are included in this issue. As we have already told our readers, these contributions were originally intended to appear in connection with the I.M.E.A. annual meeting, but that meeting had to be postponed, and all we are able to publish about the Association is the annual report and some notes on its recent activities.

Closely allied with the I.M.E.A. is the British Electrical Development Association, whose chairman, Mr. F. W. Purse, contributing to this issue, stresses the necessity for holding the supply industry together and not letting it slide back. He considers that full support of E.D.A. will ensure this. Many readers may think that his suggestion that such questions as the reorganisation of supply and standardisation of tariffs should be gone into at once is hardly possible at the present time, but nobody will deny that something will have to be done about these matters at the first opportunity to meet the difficult post-war conditions.

Immediate Possibilities

The more immediate needs are dealt with by Mr. W. E. Swale. The author, as many readers know, is power sales engineer to the Manchester Corporation Electricity Department, but he writes for us in a purely personal capacity; his views are not necessarily those of his department. He shows that in the industrial sphere the provision of electricity to new works is the first matter to be attended to, and he briefly reviews the salient points of the subject.

With regard to the conversion of existing industrial plant, his views are that if it is operating more or less satisfactorily it must be left alone, but where war requirements call for speedier production the change-over should be proceeded with. He considers that where at present a public supply acts as stand-by to works plant the positions should be reversed—the private plant should be held in readiness for any breakdown of the public supply, particularly at collieries. Industrial electric heating and lighting are applications which should receive the fullest attention.

At the present juncture, Mr. Swale says, domestic development must temporarily give way to the greater need for war equipment. Nobody will question the wisdom of this; everything has to be subordinated to the war effort, for if that effort were to fail nothing else would matter anyhow. There are, however, stocks of apparatus in hand, and we think that no objection could be raised to their installation if the labour and the comparatively small amount of material required is available.

Rural Electrification

Another desirable and legitimate outlet for electricity lies in the agricultural industry. The subject is treated by Mr. H. W. Grimmitt on page 606. He states that up to the outbreak of war work in rural areas was proceeding very favourably, thanks to the activities of E.D.A. and of individual supply undertakings. Here more than anywhere else progress is dependent upon low cost, and Mr. Grimmitt mentions what has been done by the Electricity Commissioners to contribute to the lowering of costs by relaxing standards of construction. He shows that considerable opportunities for rural electrification have been raised by wartime labour considerations.

The electric vehicle is another application of electricity which has become of greater consequence on account of the wartime restrictions on the use of petrol, and a contributor shows on page 611 that it is one that has been sadly neglected in the past in spite of its undoubted merits. The blame is placed largely to the account of supply engineers; we hope that they will take the reproof to heart, and by giving the "electric" their support conserve our petrol resources, and at the same time improve their load curves.

Standardisation of cables and equipment as a means of reducing distribution costs forms the subject of an article by Mr. S. W. Melsom. He pro-

poses, for instance, that three sizes of low-voltage four-core cable might be sufficient for most purposes, and states the desired characteristics for feeder pillars. Although in the first instance all these matters are related to home requirements they also have a bearing on the export position. Anything which intensifies or simplifies production for the home market eases the path of the manufacturer in meeting competition in overseas countries, and now export trade takes second place only to the urgent supplies for war purposes, and is, indeed, an important factor in our conduct of the war.

Speeding Up Supply

THERE is ample evidence of a freshening influence at the Ministry of Supply which imparts a feeling of greater confidence that essentials will be grasped and everything possible done to ensure the rapid provision of the many things needed for the effective waging of the war. The new Minister, Mr. Herbert Morrison, is an old acquaintance of the electrical industry. As Minister of Transport in the last Labour Government he made it his business to do all he could to further the electrical side of his Department, and was very successful at it. It is evident that he still bears the impress of that time, for at a meeting last week, when dealing with the subject of machine tools, he announced his intention of securing the greatest possible "load factor." Again, referring to his appointment of a committee of women M.P.s to advise him on salvage matters, he recalled that he was instrumental in getting a woman appointed to the London and Home Counties J.E.A. It seems to be the policy of the Ministry in exercising its wide powers of control to interfere as little as possible with concerns whose managements and workpeople are operating with speed and efficiency.

Machine Tool Census

THE MINISTRY OF SUPPLY is anxious to ensure that all machine tools in industrial establishments are being used to the fullest possible extent, and for this purpose has circulated forms to all works engaged in the engineering, iron-founding, boiler-making, motor-vehicle, aircraft, metal, instrument-making and shipbuilding industries. On these the managements have been asked to record the hours of operation of all machine tools in their factories for the week beginning at midnight, June 1st. In sending the forms out, the Minister said that he was reluctant to add to the already heavy burden which industrialists were carrying, but the work was absolutely essential to the success of the arms drive, and he was confident of a "hundred per cent." response. We are sorry that the information reached us after we had gone to press with our last issue, for we would have liked to add our weight to the appeal. The speed displayed by the Minister is, however, an indication of the urgency of the matter.

I.E.E. Council

THE next president of the Institution of Electrical Engineers will be Mr. J. R. Beard, an account of whose career appears on a later page. As the two new vice-presidents the Council has chosen Dr. P. Dunsheath (Henley's), an outstanding authority on high-voltage cables, and Major V. Z. de Ferranti, now back in the Army again, whose normal activities are symbolised by his name. Mr. E. Leete (London Electric Wire Co.) takes over treasurer's duty, and will be succeeded as representative of the companions by Lord Falmouth, who typifies, in view of his position as president of the Conjoint Conference of Public Utility Undertakings, the kind of co-operation of electrical with other bodies that can be fruitful in results. Ordinary members of Council nominated are Mr. H. C. Lamb, of Manchester Corporation, and last year's I.M.E.A. president; Mr. F. Lydall (Merz & McLellan), best known in connection with railway electrification; Mr. J. S. Pringle, of the Admiralty, where he has as temporary colleague the fourth nominee, Dr. E. B. Moulton (Oxford University), this session's chairman of the Wireless Section. Representing the associate members are Mr. H. W. Grimmitt, of the Electricity Commissioners' staff (who contributes an article on rural electrification to this issue), and Mr. F. Jervis Smith (G.E.C.), denoting the importance to be attached to industrial research. The list, as usual, indicates the varied occupations served by members of the Institution.

Electrification in Ayrshire

A REPORT which we have received that the development of rural electrification in Ayrshire has been postponed does not seem to square with the accepted policy of doing everything possible to speed up food production. Actually the report conveys a somewhat wrong impression. It appears to refer to the wide-scale scheme of the County Council for the provision of electricity to practically the whole of its area. In present circumstances it is no doubt impossible to realise any scheme which is unlikely to yield results in a short time, but the postponement does not mean that rural electrification is to come to a dead stop. Already the Ayrshire Electricity Board, of which Mr. W. C. Bexon is chief engineer, has done a great deal of useful work in the county and no doubt this work will proceed wherever it can be justified by the national need.

Cable Standards

ALTHOUGH attempts to bring about uniformity in the early stages of a development tend to cause stagnation, there comes a time when diversity of practice ceases to produce anything new of sufficient value to compensate for the expense and inconvenience it causes. Thus no good purpose is to be served by perpetuating the numerous sizes and types of cable still ordered. B.S.S. 480 is much too liberal in this respect, and fails to please users in others. Mr. Melsom in his article on page 609 refers to the holding up on account of the war of a new specification. It was as a war measure that the types and lengths of flexible cables in mines have recently been restricted, and the same argument would seem to apply to distributing cables for public supply systems.

Resistance Welding

OWING to the intermittent nature of the load provided by a resistance welder, its poor load factor and power factor and the interference it causes with the satisfactory supply to other consumers, some undertakings in the United States have done little to encourage the load. With a view to overcoming the problems involved (the chief of which are due to voltage drop rather than to heating as with most electrical machinery) the American I.E.E. appointed a committee, representing manufacturers, users and supply authorities, to investigate the position. This committee has presented to reports which appear in the Institution's journal, *Electrical Engineering*, for May. The first of these deals with machine performance and the second with installations. A third report on factory wiring for large units is in course of preparation. Lack of knowledge of all the requirements of an installation by the three parties concerned has been responsible for unsatisfactory results in the past, but the reports in question indicate a welcome tendency towards the closer collaboration needed to encourage development.

Help for the E.I.B.A.

IT is to be feared that the coinciding of the emergency appeal of the Electrical Industries Benevolent Association with the grave turn of events on the Continent may cause many would-be subscribers to withhold their help. Such an attitude is entirely unjustified, for the more serious the position the greater becomes the Association's need for funds. The extra burden which the war is placing on the organisation makes it extremely undesirable that the good work should be hampered by the necessity for spending too much time and energy on raising money. The hope is therefore expressed that the industry will realise the urgent need and make a generous response to enable that need to be met.

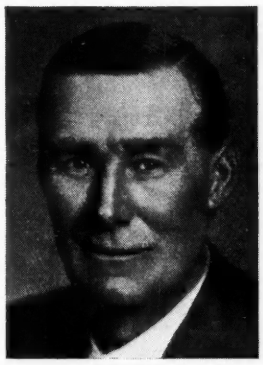
ELECTRICAL DEVELOPMENT

Past, Present and Future

By Frederick W. Purse, M.I.E.E., *Chairman, E.D.A.*

IN the political world, we are being continually urged to state our "peace aims" as well as our "war aims"; in other words we are told to "Look Ahead." Is not our industry in exactly the same position? Let us cast our minds back to the state of affairs at the end of the "Kaiser" war and recall all that has been done in the intervening period and try to visualise the problems to be tackled at the end of the "Hitler" war.

We are all familiar with the waves of legislation that started with the 1919 Act, and out of which were born our electrical apostles, *viz.*, the Electricity Commission and the Central Electricity Board. A natural corollary to the creed of the 1919 Act was the establishment in that same year of the British Electrical Development Association whose ideas and achievements are well-known to all.



Mr. F. W. Purse

May I pause here and refer to those short-sighted supply authorities who have benefited by, but have so far refrained from supporting, our national publicity body? I feel I am entitled to draw a parallel between our Association and the political position. We have seen that after eight months of fighting, it has been necessary to form a representative National Government in order that progress may be achieved. Other countries have labelled themselves as neutral or isolationists, but have now realised that "collective security" has a meaning after all. How long will it be before those isolationist or neutral supply authorities realise that they should come into line and support E.D.A. as the national body to maintain both during and after the war the rightful place of electricity supply in this country?

The progress of electricity supply during the past twenty years, in which E.D.A. has played no small part, is so well-known that reiteration is superfluous, but the higher one ascends up the ladder of progress the more difficult does it become to maintain and increase this progress. In every sphere of industrial, commercial and domestic life electricity has penetrated to a degree undreamt of a quarter of a century ago. I have guardedly said penetration because I am conscious of the fact that there are still vast fields to conquer.

Contact Must be Maintained

Whilst we may all chafe under the restrictions from which we now suffer in certain directions, this should not deter us from consolidating our position so that any weak spots may be strengthened in readiness for the next march forward. I have no patience with the "sit still and do nothing" frame of mind. Contact with the public must be maintained through our showrooms and sales representatives and by advertising, although obviously the last-named must be tempered to the circumstances and conditions of the present time. In continuing this "public relations" policy, I am quite confident that the electricity supply industry will make no attempt to capitalise any advantage of their position arising out of any disabilities which the nation is suffering due to war conditions. A reference to the high spots only of our progress programme will, I consider, be sufficient at the present time.

The use of radio has made an electricity supply to every house a *sine qua non* in present day life. As electricity can adequately meet all the other household requirements for lighting, heating and cooking, it is imperative to see that these requirements can be met, even to the extent of welcoming a cold snap; we shall not be worthy of our heritage if the collective and fertile brains of our industry are unable to find the ways and means of dealing with this problem. Our illuminating engineers and research workers have shown the way to a cheaper and higher standard of lighting, and it remains for the supply industry to see that the means at their disposal are applied in the highways, homes, shops and factories. Motive power has become to be regarded as a *fait accompli*, but nevertheless the existence of many private generating plants is evidence that much remains to be done, and like everything else, the last lap is the most difficult.

The many other and varied applications of electricity are too numerous for me to refer to in detail, but in this period of restraint there is the opportunity to take stock of these and other untapped sources, and thus enable the same leap forward to be made after the present war as after the last war.

An overriding subject is that of tariffs, and whilst we may all shudder at the mention of the word, this is one problem that has been pushed aside for the to-morrow which never arrives. So long as differences exist throughout the country in the charges for bulk supply, rates, wages and other components in the total cost of supplying our consumers, there must necessarily be differences on the financial side of our tariffs, but there should be no difference on the structural side of these tariffs; in other words, the type should be alike, although the prices may vary. Coupled with this should be a reduction and simplification in the types.

No amount of "ifs," "buts" and "provisos" will evolve an equitable tariff as a commercial proposition; it is the same in the trading of all other commodities, and why, therefore, should electricity supply try to do the impossible and continually expose itself to criticism and ridicule by cluttering its tariff sheets with long and imposing legal rigmaroles which are as clear as mud? Here is a task which cries out for that slogan "Do it now"! I whole-heartedly support the remarks on this subject made by Mr. J. C. Dalton to the recent Sales Management Conference of E.D.A. when he said: "Indeed this is the time for taking stock of such things and for making necessary alterations." Let us start a "blitzkrieg" on tariffs and the deed will be accomplished.

One word on a subject allied to electrical development, and which appears to me to call for consideration, or perhaps shall I say reconsideration. I refer to the reorganisation of distribution throughout the country. I can imagine the frenzied howl that will arise from many of my friends because I dare mention this matter; they will say the McGowan Report is buried and the White Paper is the tombstone. This, of course, is not the case, and there is no doubt that it was only the shadow of events across the Channel, now unhappily come to pass, that was responsible for the matter being suspended. We must, however, face the facts, and equally be prepared to face up to the after-war position.

The 1919 Act was a post "Kaiser" war production intended to deal completely with the electricity supply industry; the voluntary effort which the industry pleaded for and obtained did not eventually mature, and so the compulsory measure in respect of generation and bulk supply was applied by means of the 1926 Act. Is there a single piece of evidence of voluntary co-operation in regard to distribution even since the White Paper? The answer everywhere is "Leave us alone!", and yet reorganisation must come, parochialism must go. Compulsion will be applied if a voluntary effort is not made, and the present war demonstrates more than ever that something must be done.

Meeting Post-war Conditions

Changing conditions of population from flourishing to depressed areas or vice versa, whether in peacetime or war, have a reflex effect on our own industry. Security of supply, the question of tariffs to which I have referred, and even a nearer approach to standardisation of supply, are all problems which will be prominent in the public mind when, in the post-war period, our impoverished financial position will demand from us the most scrupulous economy in every walk of life.

Let us, therefore, not wait for any further Government reports and White Papers, but set about putting our industry in order to meet the needs and demands of the public who are, after all, our masters and not our servants. We know what is demanded and we can, with proper determination, fashion our own destiny in a better way than anybody else will fashion it for us.

This subject must, I feel, go hand-in-hand with the others I have previously referred to; they are complementary as the success of one is inter-linked with the success of the other. Progress creates new conditions and new conditions demand a new order of things; this has proved to be the case with regard

(*Continued at foot of page* 606.)

FARM ELECTRIFICATION

Wartime Possibilities

By H. W. Grimmitt, A.M.I.E.E.

ELECTRICAL development in rural areas was progressing at a very favourable rate prior to the outbreak of hostilities, and the number of farms served, as distinct from supplies of a general nature, was also increasing. Due to the excellent work of E.D.A. with its exhibits at agricultural shows, farmers were realising to a widespread extent the usefulness of electricity and, if the war had not begun, most undertakings would have been looking forward to connecting many more farms annually.

An interesting point is that in the last two years the rather ill-informed criticism from the farming community as to the cost of electricity in rural areas had practically died down. This was due to a better understanding of the problem brought about by the sales staffs of undertakings, the E.D.A. and, in some cases, County Community Councils.

Mr. Grimmitt is on the staff of the Electricity Commission

It should be remembered that rural electrical development in the United Kingdom has proceeded on an economic basis, and its rate of growth has depended largely on the financial return. Consequently, the aim of supply authorities has been to encourage the farm load and, at the same time, to reduce the cost of construction. The latter has been considered by the Rural Electrification Section of the E.R.A. also.

In September, 1937, the Electricity Commissioners issued a circular letter (M.2854) in which certain relaxations were made in the Commissioners' Overhead Line Regulations. These relaxations were intended to apply to light rural lines; they had the effect in some cases of reducing cost by as much as 20 per cent., thus enabling many hamlets and farms to obtain a supply which would have proved unremunerative under the existing Regulations. Unfortunately, the rise in cost of materials prior to the war has wiped out some of the saving and has had a bad effect, but further relaxations and standard forms of construction are being considered. The war, however, has brought other problems. Depletion of staffs and urgent national work has perhaps delayed farm development, even though the supply of electricity to a farm is considered of national importance.

The majority of farms in this country are isolated; consequently, agricultural development from a technical point of view consists of a series of high-voltage spur lines, either three-phase or single-phase, tapped off the main network. The materials required, viz., poles, insulators, a small amount of iron for cross-arms, copper or steel conductors and transformers, are not so easily available in time of war as in peace.

In this country practically all rural lines are supported by means of red-fir creosoted poles imported from Scandinavia. Now this supply has ceased, and in place of these poles home grown timber, ferro-concrete and, perhaps, in some cases, lattice-steel poles will be used. Some home grown timber, if pressure creosoted, is equal in quality to imported timber, and most of it is satisfactory except, perhaps, spruce. Larch poles, if treated according to the B.S. Specification No. 513, should prove quite satisfactory. Owing to the urgent need for timber for other purposes a certain amount of trees suitable for poles will be felled during the summer months. As it is impossible to creosote these poles or to preserve them satisfactorily once the sap is up, they are of little or no use for ordinary overhead-line construction. Their life may be estimated at from three to five years, and it is suggested that they could be used quite successfully for lines of a temporary nature. Since cost is the one vital factor for farm supplies and, as the war proceeds, the cost of timber may increase, consideration may have to be given to reinforced-concrete poles. The B.S.I. went to much trouble in the preparation of its specification for concrete poles, and the E.R.A. has also produced reports on tests of these poles.* These publications should give guidance to undertakings contemplating the use of such poles, which it appears, can replace timber in many instances, should the steel be readily available. The existing stocks of creosoted Scandinavian poles should be conserved and should only be used for permanent lines.

The Commissioners, in specific cases, have relaxed Regulation 17 of El.C.53 (Revised) for the purpose of permitting overhead lines to be erected with unearthed metal work. This reduces the cost of the line, and incidentally less lightning and bird trouble is experienced. It also permits the use of timber cross-arms, thus saving steel. Many lines have recently been erected of this form of construction in the United Kingdom and have proved very satisfactory. During the storms in January this year, no more trouble was experienced with lines erected to the reduced loadings permitted by the Commissioners' Circular M.2854 than lines designed to the normal regulations.

Feeding Stuffs and Labour

Owing to the war the demand for electricity in rural areas, especially for agricultural purposes, has increased and electricity can very materially help the Government's drive for increasing food production in this country. The shortage of prepared feeding stuffs, which has been one of the most serious results of shipping restrictions, has made farmers with livestock think seriously of their position in the future. Most of them have put down some arable land to grain suitable for supplying some considerable part of their feeding requirements next year. This will, in most cases, have to be ground or chopped or rolled and perhaps to be mixed as well. As a result, handling and preparing food-stuffs on the farm, which had become almost a forgotten art owing to the activities of prepared-food merchants, will have to become almost universal again. As a result it is reasonable to expect, during the next twelve months, a large increase in the number of grinding and mixing plants installed. This will apply more to grinding plants, as many farmers who bought ready-ground food still prefer to mix it on the farm.

With the strain on tractor resources which will be imposed by field work it is impracticable to expect to divert them to such stationary work as driving grinding mills. It is a case then of either a stationary engine or an electric motor; labour will be scarce and work will often be done by women, and the advantages of electric drive will become overwhelming. Then, too, the convenience offered by electricity in automatic control will enable smaller and cheaper mills to be used and run for longer periods without attention.

Because of the enforced extra arable acreage and because of voluntary extra ploughings to supply feeding stuffs for the farm, there will be an increase in the amount of grain crops to be threshed. There is every likelihood of the capacity of the existing threshing facilities being severely strained. In any case it will mean that many farmers will have no grain threshed until after Christmas. This will be a particular hardship on farmers who have grown grain for feeding their stock and who may want to have it threshed at some time inconvenient to the threshing contractor.

It is confidently expected by many qualified to judge that many farmers will become impatient of the contract system of threshing which has such a hold on English farming. They will look round for means of installing and running their

* B.S. No. 607. E.R.A. reports F/T51, F/T100, F/T109.

(*Continued at foot of opposite page.*)

Electrical Development (*Continued from page 605*)

to generation and main transmission, and so also must be the case in connection with distribution.

I, therefore, plead for a hundred per cent. support of E.D.A. by the supply authorities, for a maintenance, both national and regional, of a public relations policy, for a review of ways and means for expanding all possible outlets of supply, for a revision of existing types of tariffs and for a reconsideration of the present organisation of distribution. It is earnestly to be hoped that one result of the war will be that the obstacles to progress, like the Maginot and Siegfried lines, can be removed. Shall we mould the circumstances, or let the circumstances mould us? In the words of a well-known broadcaster "What about it?"

SALES POLICY NOW

What the Supply Industry Should Do

By W. E. Swale, A.M.Inst.C.E., M.I.E.E.

A REQUEST to contribute an article on industrial sales development at a time when the curtain had risen on a critical stage in the war gave rise to mixed feelings. At the moment of writing the men with the least troubled minds are probably those with a plentiful supply of ammunition by their side, and a clearly defined objective before (or beneath) them. Only a stage less contented are those actively engaged in feeding the war machine. The least happy, because apparently the least effectual, are those who sit at their desks trying to plan a policy which will satisfy the divergent interests of their industry and their country. Yet Mr. J. C. Dalton, in his excellent address to the recent E.D.A. Sales Management Conference, rightly stated that the electricity supply industry is one of the most powerful of the industrial fighting services. It is, therefore, well to review our sales policy frequently in order to ascertain in what manner the supply industry can make the maximum possible contribution to the nation's war effort.

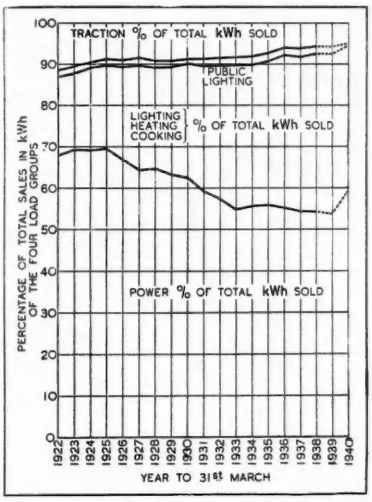

TRACTION % OF TOTAL kWh SOLD
PUBLIC LIGHTING
LIGHTING HEATING COOKING
% OF TOTAL kWh SOLD
POWER % OF TOTAL kWh SOLD
PERCENTAGE OF TOTAL SALES IN kWh OF THE FOUR LOAD GROUPS
YEAR TO 31st MARCH

Fig. 1.—Sales of four consumer groups expressed as percentages of total sales (in kWh)

Supplies to New Works

These cases, fortunately, raise no questions of principle. New works will, almost invariably, be engaged on war production. The advantages of a public supply for industrial requirements are now so well established that there is seldom any possibility of competition. The only problems, beyond those of obtaining delivery of the requisite mains and substation equipment, relate to the financial conditions, in cases where considerable capital outlay is involved.

A number of precedents have, by this time, been established. It is usual to offer either a standard long-term agreement with a "break-clause," or a special short-term agreement. In either case the consumer, through the appropriate Government Department, undertakes to repay to the supply authority the irrecoverable cost of giving supply. This cost is estimated provisionally. The final figure may be modified, in the event of the works ceasing production prematurely, according to the extent to which the mains and substations concerned can be utilised for the subsequent peacetime distribution of electricity supplies.

Private Plant Position

In normal times a fruitful field of development lay in the large amount of private plant (estimated at ten million horsepower) which is still in use in this country. Much of it is relatively inefficient, but in present circumstances one is not justified in pressing for conversion, except in cases where the plant is working for war requirements, and the increase in output resulting from the electrification of the works would be substantial

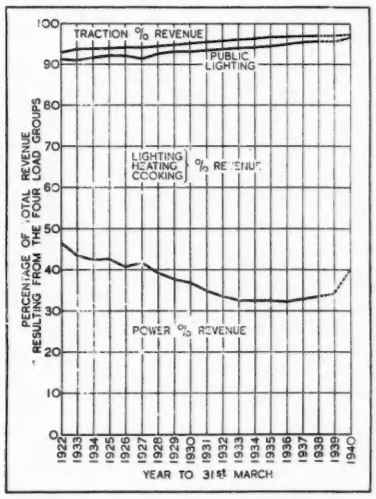


Fig. 2.—Revenue from four consumer groups expressed as percentages of total revenue

There has been an increasing tendency, in recent months, for manufacturers operating private plant to ask for a public supply in addition to their own. The familiar reasons—overloading of their own power plant, the desire for additional security, uncertainty about future coal supplies, &c.—all afford good scope for the sales engineer. But a distinction should be drawn between dual supplies, which tend to emphasise the advantages of purchased power, and purely standby supplies

Farm Electrification (*Continued from previous page*)

own threshers. To do this by buying the traditional 4 ft. or 4 ft. 6 in. thresher means a heavy outlay of capital. There is, however, available a range of excellent small threshers of from 1 ft. 6 in. to 2 ft. 6 in. in size, capable of doing serious work and requiring little power and little labour. That such machines are considered a worth-while proposition by so many farmers in the North of England and in Scotland shows that they have proved themselves. Their rate of handling the crop is, of course, proportionately lower, but the labour demand is only of the order of two or three men and very little readjustment of the farm routine would be necessary. There is every reason to believe that such small machines would handle the whole crop of from 50 to 75 acres, if not more, without any untoward rearrangement of farm practice. They would be ideal for handling by women. These machines are essentially suited for electric drive and are likely to offer loads of from 5 to 8 HP.

The great wartime difficulty in dairy farming will be the shortage of skilled labour and indeed, in time, shortage of labour of any kind. The latter contingency will directly result in the installation of new milking machines. The former difficulty will arise with dilution by the Women's Land Army, conscientious objectors, etc. Now, while careless workmen are fatal to the handling of machines for milking, it is probable that enthusiastic workers are more readily trained to carry out the handling of the machine parts, sterilising, etc., than to acquire the finer art of hand milking. We may then confidently expect an increase in machine milking plants. Similar considerations may apply to the use of sterilising plant, and it is probably true that unskilled workers are more quickly trained to use electrically operated sterilising chests than those of other types; whether this will result in a substantial increase in the installation of such apparatus depends to a large extent on the personal approach of and tariffs offered by the supply authorities.

On the other side of the balance comes poultry farming. The official policy has been to make poultry the earliest to suffer from food shortage, especially table poultry. As so much of the electrical load on poultry farms was for the purpose of producing table birds on intensive lines, it is to be feared that this load will be reduced for the duration of the war.

Another use for electricity is in the hot bed, although this may have a wider outlet in urban areas. It has been suggested that owing to the scarcity of manure electrically heated hot beds for allotment holders would prove very useful and economical. Certain obvious difficulties in arranging the supply to allotments might be obviated by placing the beds in groups at some central point easily served, and these would meet the needs of quite a large number of allotments.

The use of grass driers may be expected to increase with the rapid increase in aerodromes where the practice of cutting and drying this grass under contract has been established by several successful examples. In addition there is the attraction that a farm growing grass for drying is exempted from compulsory ploughing up of any of its area.

It will be seen from the above that the demand for electricity for agricultural purposes will increase during the war. How this increase will be met will depend on the availability and cost of materials, and it is hoped that the supply industry will be able, as it usually does, to rise to all emergencies.

where the supply authority is only drawn upon in emergency, in the event of war damage to consumers' private plant.

It has been suggested, for example, that those collieries which normally generate their own power should be linked up with a local electricity supply undertaking as an emergency measure. It may be found much more economical, in practice, to let the supply authority take over the normal load, retaining the colliery's old steam plant for use in emergency. An example of satisfactory dual operation is where private plant—generating direct current—is retained for surface work, and a public supply of alternating current is taken down the shaft for coal-cutting and underground haulage.

Heating and Lighting

War production has well substantiated the claims of electric heat in the form of ferrous and non-ferrous metal melting, heat treatment, and welding. When the time is opportune to describe progress in detail it will be found that rapid development has taken place in many directions in which closely controlled heat is essential. Such applications are largely non-competitive, and need little attention from supply authorities' representatives. The only problems likely to arise are those concerned with the adequacy of mains, and of voltage control in the case of large arc furnaces and resistance welding sets. These latter are now being made in sizes approaching 1,000 kVA.

A suitable standard of illumination is so important a factor in achieving maximum production that the work of lighting specialists is completely justified in the national interest. A new factory is not likely to be deficient in this respect; in fact the lighting of some of the latest works reaches intensities almost unthought of even a few years ago. It is in the many older works which have been rapidly adapted to war production that the lighting still leaves much to be desired. The activities of E.L.M.A. in this field deserve the fullest support, and supply authorities should co-operate in good time, so that existing works lighting can be overhauled and improved before next winter.

Trend of Sales

Figs. 1 and 2 illustrate the varying proportions of sales (in kWh) and revenue respectively of the four groups into which the Electricity Commissioners' Annual Returns are divided. The latest published figures are those for the year ended March 31st, 1938. Those for the next two years are merely approximations. Fig. 1 shows clearly the effect of the big drive for domestic electrification in recent years. From 1922 to 1938 the total of all electricity sales (by authorised undertakings in Great Britain and Northern Ireland) rose from 3.146 million to 19.263 million kWh. In 1922 units sold in the group "Lighting, Heating and Cooking" represented only 19 per cent. of the total; by 1938 this group made up 38 per cent. Conversely the group "Power" represented 68 per cent. of all kWh sold in 1922; by 1938 the ratio had fallen to 54 per cent.

It must be noted that units sold in the first group are relatively high-priced (average revenue in 1938=1.73d. per kWh); those in the "Power" group are low-priced (average revenue in 1938=0.64d. per kWh). The significance of this is indicated more clearly in fig. 2 which shows that in 1938 over 62 per cent. of the total revenue was derived from units sold in the group "Lighting, Heating and Cooking." An inevitable result of the nation's wartime economy will be a shrinkage in sales to the high-priced group, and an increase in revenue from the low-priced group. Where tariffs are reasonably related to costs of supply a readjustment to a lower income level may have no serious consequences. Unfortunately the costs of supply to the small domestic consumer tend to remain constant, even when the revenue per consumer decreases. It is generally agreed that supplies to large power consumers leave little margin of profit. There is therefore every justification for some readjustment of domestic and lighting tariffs and a curtailment of hire schemes.

National "Self-denial"

Until a few weeks ago sales managers were noting with satisfaction that the demand for many classes of domestic and commercial appliances (notably fires, water heaters, cookers and refrigerators) remained buoyant, even under the restraints imposed by the Treasury, and the truce with the gas industry. In spite of the virtual cessation of advertising, the goodwill created in times of peace continued to bring in a steady flow of business. The recent turn of events will make the greatest possible demand on personal sacrifice and personal effort of every man and woman on the home front. What, one asks, should be the sales policy of the industry in the light of these grave developments?

From the national point of view there can only be one answer. Every form of service by the supply industry should be encouraged which will accelerate and safeguard the production of vital necessities; every service, on the other hand, which is merely a desirable but non-essential improvement in the standard of living, should be discountenanced. The inevitable temporary curtailment of sales development would have to be accepted as the price of victory. What would be the practical implications of such a policy? It means that a fundamental distinction would have to be made between service and selling.

Service to industry would include not only the normal advisory work of the technical sales engineer, but—in the event of breakdown of electrical plant due to air-raid damage, &c.—the fullest help on the part of the local supply authority. Initiative has already been shown in several industrial areas in organising the joint use of consumers' stocks of spare motors, starters, &c. In other cases "pools" of consumers' transformers and distribution switchgear are being formed.

In the domestic and commercial spheres the policy would mean giving fully and freely any advice which would lead to a more economical use of electric light and heat. In this category of service would come demonstrations of effective "black-out" measures, advice on tariffs, &c., and particularly the Government-sponsored demonstrations of wartime cookery. When it comes to the sale of new appliances, it will probably be found that considerable difficulties will shortly be experienced in replacing existing stocks. There will then be an opportunity of popularising yet another type of service, namely, the repair and reconditioning of existing appliances. There must be, in the aggregate, many thousands of faulty irons, kettles, radiators, &c., on consumers' premises, and considerable numbers of derelict cookers and water heaters in the stores of supply undertakings, all of which could be reconditioned, and put into commission again for the duration of the war. It will go against the grain to suggest a repair job in place of a new sale, but it is clear where one's duty will lie. Finally, it is suggested that much of the customary peacetime "waiting-on" consumers should be cut out.

The country's crying need at this critical time is for more men in the fighting and defence services, more output of munitions and war material, and strictest economy in the use of basic raw materials. The supply industry is able to make some contribution in all three directions. If such contributions involve retrogression in sales development, one can only hope that subsequent peacetime recovery will make the temporary sacrifice worth while.

Blackburn Engineer's Report

IN the light of the recent decision of the Town Council—arrived at without consulting the Committees concerned—to amalgamate the sales organisations and showrooms of the Gas and Electricity Departments, the views expressed by Mr. R. H. Harral, the electrical engineer and manager, in his annual report for 1939-40 are of particular interest. He shows that by active development of general power and domestic supplies his Department has avoided the severe financial loss which would otherwise have resulted from the restrictions imposed at the outbreak of hostilities. Instead, there was a net profit of £9,778 and an increase in electricity sold (omitting bulk supplies to Darwen) of 13.2 per cent., with the total standing at 53.9 million kWh. Of this 27.7 million kWh was supplied for power and 11.4 million kWh at the domestic rate, representing increases of 26 and 16 per cent., respectively.

It is not possible, Mr. Harral says, to indicate how much longer the Department will be able to withstand the additional costs which, in common with other undertakings, it now has to bear, without passing them on to the consumer. Every effort is being made to delay this as long as possible, and he maintains that only an active sales and development policy can effectively achieve this object. In a later reference to the subject he observes: "It is hoped that every encouragement will be given to the undertaking to continue its present active policy which is not only sound from a business point of view but brings satisfactory results to the consumer."

With regard to the showrooms, it is stated that although sales have fallen off somewhat due to the war, the total load of apparatus disposed of during the year under the hire and hire-purchase schemes was 6,639 kW, against 7,888 kW in the previous twelve months. The load sold at the showrooms constitutes collectively the largest block in the area, apart from the important contacts which it must make as a service centre. There is a real market, even in these times, for increased sales of electricity, Mr. Harral states, and efforts in this direction should be strengthened rather than relaxed.

The value of the assisted wiring scheme is evidenced by the fact that the total revenue received from this type of consumer was £32,947, of which £23,520 was for electricity supplied (2.9 million kWh). The balance of the rentals received provided for payment of the whole of the capital charges, inclusive of the cost of maintenance of installation. The total revenue of the Department was £275,523 (against £262,105) and working costs £180,040 (£165,643).

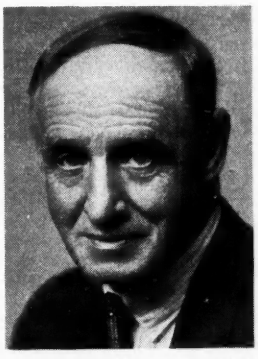
STANDARDISING DISTRIBUTION

Cables and Network Accessories

By S. W. Melsom, M.I.E.E.

WHILE the outbreak of war has prevented the embodiment in the form of a new B.S. Specification for mains cables of the results of the discussions which have been taking place for the past two or more years, there is little doubt that the subject will be reopened immediately conditions permit. It is an open secret that the current B.S.S.480 as a substitute for the older B.S.S.7 has not been universally acceptable and that quite a fair proportion of cable supplied has continued to be to the older specification.

The value of a British Standard Specification is to be judged by the extent to which it is used by purchasers, and the unsatisfactory nature of the present position has produced a strong movement for a new specification which would be the only one for all mains cables and which would be acceptable to, and adopted by, the supply industry generally. The present hiatus may be turned to good account if it can be used to encourage thought in the direction of agreement on certain salient features.



Mr. Melsom is on the staff of the Electricity Commission

Low-Voltage Cables

The selection of standard sizes for cables in a low-voltage network is wholly a matter for supply engineers. Clearly it is not easy accurately to forecast the load for a given distributor and, since the data on which estimation has to be based is at the best nebulous, there are overwhelming reasons for the adoption of a few—possibly not more than two—standard sizes for a given system of l.v. four-core cables.

Mr. L. Romero, from 1934 onwards, has consistently advocated the adoption of very few standard sizes and in his article in the ELECTRICAL REVIEW of June, 1935, he advocated 0.125 and 0.25 sq. in. as suitable and sufficient for most requirements. While this view is not shared by all supply engineers, there is much evidence of the tendency to adopt one or two sizes only. The same evidence shows that the sizes being adopted are so nearly those suggested by Mr. Romero and other distribution engineers as to make it reasonably evident that the very large number of authorities could, with advantage to the industry, agree to use only a selected number of sizes for the greater part of their low-voltage distribution.

It is hardly necessary to labour the point of advantage to all concerned of effecting this measure of standardisation. Apart from the advantage to the supply authorities in keeping stocks of both cable and jointing accessories, it must result in economy in manufacture, better delivery and a degree of standardisation of fittings which has not hitherto been possible.

Three Sizes Suggested

Taking 0.1 and 0.3 sq. in. as probably the largest and smallest economical sizes of four-core low-voltage street distribution cables, the whole list of sizes to be considered in the present B.S.S.480 is: 0.1, 0.12, 0.15, 0.2, 0.25 and 0.3, and the main point of difficulty in arriving at complete standardisation appears to be the fact that authorities are almost evenly divided in their choice, some electing for 0.15 and 0.25, and others for 0.1 and 0.2 sq. in. The size of the undertaking and the load density must vary as between districts, and therefore to cover the complete range, it is suggested that three sizes of four-core cable are required, *viz.*, 0.1, 0.2 and 0.3 sq. in. Of these the smaller sizes are probably sufficient for the smaller systems, and the larger for larger systems.

It is argued that there will be a certain amount of difficulty in the change from, say, 0.15 to 0.1 or 0.2, but this is not really serious. It is, no doubt, difficult suddenly to jump from one size to the other, but if engineers would use one or the other of the three sizes mentioned for all new work the solution to the problem of reducing the number of standard sizes would appear to be found.

In postulating a general rule of this kind I would suggest that there is no need for alarm on the part of those interested in the comparatively few systems which use cables outside the range of those mentioned. Smaller or larger or even intermediate sized cables can always be made available, but these exceptions should not affect the general rule which, in fact, like other exceptions, they help to prove.

There seems little doubt that the sizes of cable suggested for services—0.0225, 0.04 and 0.06 sq. in. in both twin and four-core—will meet all reasonable demands in the great majority of cases. Where larger sizes are required a four-core distribution cable or a twin cable of equivalent size can be used.

In the early days engineers were inclined to follow the old three-wire idea that the size of the neutral could be 50 per cent. of that of the main conductors, but increase of size of system and the impossibility of accurate balances has shown that, in the best cases, the size of the neutral cannot be less than 75 per cent., and in the great majority of cases it should be of the same size as the main phase conductors. There are strong arguments in favour of making the neutral the full size; from a manufacturing point of view a symmetrical cable is preferred—not only for its shape but because all internal mechanical stresses are properly balanced, although many cables with reduced neutral have given wholly satisfactory service.

From the supply engineer's point of view the arguments should be almost equally strong. If it is certain that the current in the neutral will be less than that in the main cores a certain amount of copper might be saved, but it is most doubtful whether this condition is ever sufficiently certain to justify the comparatively small saving effected by replacing a small amount of copper by the other materials that must be added in order to produce a symmetrical cable.

Shaped or Circular Conductors

The modern trend, in that it insists on the good engineering principle that the work shall be done with the minimum amount of material, is the real driving force behind the cable with shaped conductors. It is a smaller cable and is more economical both from the point of view of quantity of materials used and of current rating, which is somewhat higher than for cables with circular conductors. Admittedly, jointing is somewhat more troublesome at the outset to those used to circular conductors, but experience—and there is now a great deal of it—has shown that with the use of suitable tools jointers soon get used to making service connections to shaped conductor cables.

Initial difficulties experienced in the construction of this type of cable have now been almost entirely obviated by the evolution of suitable machinery. Where, as is now usual, the cable manufacturers are equipped with the proper plant, it is safe to say that the shaped conductor cable makes quite as satisfactory a job as the circular conductor cable and should be technically a better cable.

Identification of Cores

Hardly anything has given rise to so much trouble as the identification of cores by colouring—this apart from the initial difficulty that it is impossible to obtain the same shade with a coloured paper impregnated with oil as with a painted or enamelled surface. Naturally enough most engineers would wish the system of cable colours to be in line with those for switchgear busbars, &c., but a little study of B.S.S. 158—1938 shows that this is impossible. The colours for switchboards and busbars are related to the arrangement of the system—an admirable and well-worked out scheme to facilitate switching operations, &c.—but they cannot be, and there is no reason why they should be, embodied in the cables.

The colours required for operation must be open to view and are applied with a paint brush. The cable cores, however, are enclosed in the cable sheath to the sealing end or trifurcating boxes and the tails from this box to the switchgear can be painted the necessary colour to conform with the method adopted for busbar marking. If the earthing or other conditions of the system, or any part of it, is changed, thus requiring a change of colours, the same paint brush will do what is necessary.

Therefore the proposals that have been put forward envisage leaving the colours to the switchgear manufacturers and using numbers for the identification of cable cores, a method which

it is claimed will fit in with any colour scheme. Thus the jointer who handles the low-voltage distribution cable while it is alive can as easily work on Nos. 1, 2, 3 and 4 as with colours, and the system has the great advantage that the cable cores can be connected to bars with any colour or sequence of colours which has been adopted to meet the needs of individual engineers.

Belted or Non-belted Low-voltage Cable

The 460-V beltless cable introduced to meet the then urgent demand for a cheaper cable has been adopted with success by several undertakings, but a large proportion of engineers have refused to consider it on the ground that factors of safety are cut too fine, especially from the point of view of damage to the dielectric during jointing. On purely theoretical grounds the cable should be wholly satisfactory, but on practical grounds it is clear that there is an irreducible minimum of thickness of dielectric and of lead sheath required to ensure freedom from danger in laying, handling and jointing. In this, the cablemaker is entirely in the hands of the supply engineer, except that he would vastly prefer to have one standard rather than two or more.

The present position, after very much discussion among interested parties, is that engineers are agreed that the non-belted low-voltage cable should be deleted from standard practice and that the sole standard should be the 1,000-V cable in the current B.S.S. 480 which again is very closely in line with the 660-V cable in the older B.S.S. 7.

Cable with Switching Conductors

The requirements of individual supply engineers as to the size of switching, or better-called "special purposes," conductor in a four-core cable are so diverse that a degree of standardisation is imperative. From information obtained from a number of sources it is obvious that the conductor required cannot be incorporated without affecting the diameter of the cable, and, therefore, it is recommended that a separate list of standard sizes of cable should be included providing for a fifth conductor of size—0.0145 sq. in. for four-core cables having a main conductor of 0.06 sq. in. and smaller, and 0.0225 sq. in. for sizes from 0.06 up to and including 0.4 sq. in. It is hoped that these sizes will be amply sufficient for all purposes and that they will be acceptable to the supply industry.

Standardisation problems with high-voltage distribution are fewer and much less troublesome than with low-voltage. The cables are already well standardised and jointing is comparatively simple. It is, however, hoped that many of the recommendations made for low-voltage, such as shaped conductors and identification by numbers, &c., will be acceptable.

It is, in a way, fortunate that in the intense development work in distribution that has taken place during the past decade, so large as to amount to practically a revolution, engineers have been untrammelled by many preconceived ideas or by specifications, and so have been free to devise their accessories frequently by selecting the best features from a number of makers' standards with a view to meeting the requirements of their districts and to dealing with the heavy fault currents that may be encountered on a modern system. The larger supply concerns have, in many cases, introduced their own specifications, these incorporating the individualistic work of the supply authorities, designers, research engineers and manufacturers. As might be expected, these specifications are nearly uniform in their broad principles, but a great deal of agreement on detail is required before real uniformity can be reached.

Safety Factor

One of the most important considerations is the always unknown factor of safety to be adopted—a figure which is largely a matter of opinion coloured often by a single unhappy experience or by a particularly lucky one. There are, however, certain to be two, or possibly more, schools of thought, one where cost is not so important and the other where the type of district requires the cheapest possible construction even though a little risk is taken.

This question of factor of safety and cost, now nearing solution, has involved a tremendous amount of work on the part of designers, research laboratories and testing authorities, with the result that something approaching the right thing is in immediate prospect. True, there are a number of what may be termed non-fundamentals governing present-day designs, such as the old controversy of a joint box split on the centre line as against a lidded box, and the use of steel or cast-iron, but there has been general agreement, or nearly so, on the type of materials for insulation purposes, on their form and size, on the clearance necessary, and the like, and many designers are of opinion that the happy compromise between cost and performance has been reached. This all means that, as regards many of the components, the time is rapidly approaching when complete standardisation, including interchangeability, of important components can be effected.

It is unnecessary to labour the point of the advantage to all engineers of such standardisation with its simplicity of stocks, &c. It must, however, be appreciated that several important points, are still under discussion, the settlement of which will be an essential part of the work of the Standards Committee, such as the following:—

(1) Factor of safety. On this the manufacturers can probably furnish sufficient evidence to show that an ample factor of safety is provided and that more is unnecessary and less would be foolish.

(2) Interchangeability and standard dimensions. There would have to be rigid agreement on the dimensions which have to be standardised. This, in view of the very large cost of jigs, tools,, &c., required for mass production. In fact, dimensions should be most carefully considered so that they can go for a long time unchanged.

(3) Finish. This is really a question of protection from corrosion, and as such should be taken seriously: from the tinning on current carrying parts to the most effective protection of all exposed iron and steel parts from atmospheric and soil corrosion.

(4) The Specification should clearly set out all the parts considered to be embraced by the term designating the accessory. This might be novel in a B.S. Specification, but its inclusion would ensure that, in this respect, all tenders would be on the same basis.

(5) While rigid in many respects, the specification should allow scope for the introduction of any improved designs and materials that may be developed as a result of research and experience. I would, however, make it a *sine qua non* that any such specification should not only be fully considered before it is issued, but that those concerned should be assured in advance of the full support of the supply industry.

Feeder Pillars

Although not so fully advanced towards complete standardisation as many other accessories the feeder pillar is a fair example of the way in which conditions of use influence the modern trend towards standardisation. The question of accommodation available has required concentration on smaller designs than ever before, and the more modern type of pillar required to be erected against or set in a wall has produced designs which, since they have to be based on requirements of space, are surprisingly uniform in many essentials.

Pillars of this type are generally required to have the following characteristics:—Accessibility for all operations, such as jointing from the front only; total depth not more than 12 in.; interchangeability of the units in the pillar; units fitted with cartridge-type fuses of high rupturing capacity, together with carriers suitable for various makes of fuses (of many ratings); suitable for use of tong testing ammeters.

The approach to standardisation of this type of apparatus, however, has depended largely on the type of fuse element available. Requirements of space and the heavy short-circuit current now possible have no doubt solved the question of the type of fuse to be used, and the recent edition of B.S.S.88 has been of great assistance in the selection of a suitable fuse element.

There appears to be a very good prospect of the h.r.c. fuse reaching standardisation in measurements and characteristics (several firms have interchangeable ranges), but not of the handles or carriers, as each maker has his own patent ideas for securing the cartridge in the handle and for tightening up the complete fitting on the terminal contacts on the units.

Swiss Postal Railway

AN underground railway has recently been built in Zurich for the conveyance of letters and express packets between the branch post office at the main railway station and the Sihl post office, a distance of about three-quarters of a mile. A driverless electric truck is set in motion by pressing a push-button on the main control panel. At the railway station terminus the truck runs on to a lift, which operates automatically, rising to the level of the post office above.

The railway is operated by a three-phase, 220-V, 50-cycle supply, which obviates the need for convertor sets or special gear on the motor truck for reversing, this being accomplished by changing over two phases of the supply.

The motor truck has two axles, one of which is coupled through gears to a 3.5-HP three-phase induction motor, giving the truck a speed of 14.4 ft. per sec. The other axle is driven by a 1-HP motor for running at low speed (0.98 ft. per sec.). The latter motor is brought into operation at the stations by means of an electro-magnetic coupling controlled by a change-over switch which is actuated by a roller which contacts with a third rail in the station sections. The truck is fitted with a mechanical brake operated by spring force. The order for the whole installation was placed with the Oerlikon Co.

ELECTRIC VEHICLE STAGNATION

Survey of Psychological Factors

By Observer

THE recent discussion in the ELECTRICAL REVIEW of the prospects for the electric vehicle indicates that the arguments on this old, familiar subject have not advanced much beyond the equally old and familiar *tu quoque* level. While it is generally admitted that the prospects are brighter to-day than ever before, it is also recognised that progress is still lamentably slow. In searching for an explanation of the disappointing results, vehicle makers, battery makers and supply engineers are inclined to blame each other, and the onlooker is apt to blame all three. Not only does their mutual recrimination produce little positive result, but it also obstructs the co-operative effort to establish the electric vehicle in its proper place as the most economical and convenient mode of transport over a very wide and important field.

As this situation, in its essential features, has been chronic for the last thirty years or so, it seems to call for an analysis which will go deeper than such factors as battery imperfections, excessive vehicle costs, high rates for charging, or even the apathy of the supply industry. Some of these factors may, on the deeper analysis, prove to be effects of underlying causes, and additional influences, hitherto unsuspected, may be disclosed.

Unrealised Hopes

Looking back over the history of the electric vehicle in relation to the industry as a whole, two interesting features emerge. One is that the electric vehicle is practically the only form of electrical application which has not fulfilled the hopes of its champions. In every other direction—lighting, heating, cooking, domestic uses, power applications, traction, and so on—there has been cumulative progress. The early stages were highly controversial; the younger electrical engineers of to-day have little notion of the polemical energy needed to demonstrate the advantages of electrical applications which are now accepted without question. Some of that energy had to be applied within the electrical industry itself, since not every electrical engineer of thirty or forty years ago was a missionary of the all-electric age. But in spite of all the difficulties, growth was the order of the day—except in the case of the electric vehicle.

The second feature is that the case for the electric vehicle was conclusively proved as far back as the last war. This may seem a bold and perhaps a reckless assertion, but it is a simple statement of fact. More than one important firm in London has been using battery traction for a quarter of a century; in some cases the original vehicles, with changes in batteries and tyres, are still in service. Bearing in mind the improvements made in petrol vehicles during the same period, it is clear that these firms must have found, and must still find, the electric vehicle consistently the best for distributive services within a short radius. These firms, moreover, are the very last to keep in service any form of transport which did not fully justify itself on a cash basis.

An Attractive Proposition

When the vehicles in question were first put on the road, batteries were not so efficient as they are to-day, the vehicles themselves were costly, and charging equipment more expensive and less convenient than the modern type. Nevertheless, it was possible to convince keen and intelligent business men that the electric vehicle was a sounder proposition than either the horsed van or the petrol car for this particular class of service. One cannot, therefore, attribute the lack of progress in battery traction to the absence or inadequacy of this or that particular factor. Recent advances in vehicle design and in servicing have made the proposition more attractive—so much more attractive that any electrical engineer who tried to sell electric vehicles twenty-five years ago might think that his modern successor has quite an easy task.

In point of fact, however, the job remains tough and disheartening. Enthusiasts speak of raising the number of electric vehicles from 5,000 to 100,000, but few of them have the heart to calculate how old they will be before this noble figure is approached, taking the present rate of advance as an index.

What, then, is the *real* reason for the inability of battery traction to keep pace with electrical progress? Or, to put the question in a more limited and pointed form, what is the real reason why the electrical industry itself has not adopted the electric vehicle as a matter of course? Every supply undertaking, or at least every urban one, uses service cars on point-to-point duty within a restricted area, and in the overwhelming majority of cases these vehicles are still petrol-driven. To make the anomaly more glaring, supply undertakings use their petrol vehicles to advertise electricity, going so far in one case as to put the words "Use Electricity—No Smoke, No Fumes" immediately over the exhaust. The indifference of the supply engineer towards the electric vehicle is, or was until recently, so general that one is tempted to regard it as the root cause of the backwardness of battery traction. Clearly, if supply engineers had been really keen, they would have adopted electric vehicles wherever suitable, offered low rates for charging, provided ample conveniences for charging, and used their experience to back up the general case for battery traction. They could, in fact, have made the path of the electric vehicle salesman comparatively easy. But here again we are left searching for a deeper cause—the cause of the supply engineer's indifference to this one electrical application, in contrast to his ready advocacy of all others.

It is probable that the supply engineer can give reasons, quite convincing to his own mind, for leaving the electric vehicle out of his active propaganda effort. The process of "rationalisation," or the creation of plausible reasons for an action or attitude which is really instinctive, is familiar to psychologists. Where the subconscious springs are strongest, the rationalisation becomes most artful and exuberant, and the resentment of the individual against the charge of rationalising most intense. If, however, a supply engineer, or indeed any kind of engineer, will probe into his own feelings in this matter, he will soon realise that the electric vehicle, as a vehicle, makes far less appeal to his enthusiasm and interest than a petrol vehicle.

In the first place, the petrol vehicle possesses what every man desires—*speed*. Electrical engineers are, in general, keen motorists and they are just as prone as other men to delight in having covered so many hundred miles in such-and-such a short time. They would be less than human if they did not feel a trifle contemptuous of vehicles which, except on a steep down grade, could not possibly do more than 12 miles an hour. The fact that in urban areas the electric vehicle can, on account of its superior acceleration, keep station with petrol traffic does not make it less of a humdrum affair. Compared with a car that can do a burst at 50 miles an hour, the electric vehicle is a mere tortoise.

Freedom from Trouble

In the second place, the electric vehicle gives no trouble; it does its job, day in and day out, for years on end with only occasional intervals for minor adjustments. A petrol vehicle, on the other hand, requires frequent overhauls. On a strictly engineering basis, this contrast is all in favour of the electric vehicle, but engineers, being human, do not always treat things on a strictly engineering basis. It used to be said, with a fair measure of justice, that when two or three electrical engineers were gathered together they were discussing either the last record run they had made, or the latest ailments of their cars. The necessity of perpetually tinkering with this or that part of a complex mechanism gave the petrol car an interest, indeed a fascination, which the electric vehicle could never hope to rival. There is a parallel example in the case of human beings; the woman who is ailing off and on invariably gets more consideration than one whose health is uniformly robust.

Another paradox is revealed when we examine a further outstanding advantage—from the strictly engineering point of view—of the electric vehicle. Apart from its battery, an electric vehicle is good for twenty or thirty years of active life, while the efficient life of a petrol vehicle is so short that the user has got into the habit of selling last year's car for this year's model. Here again the contrast ought to make the electric vehicle popular, but the actual effect is the very opposite. After ten years' service an electric vehicle looks like a museum piece, although it is just as efficient as ever. The petrol vehicle, on the other hand, dies young and renews itself in an improved form, a feature which, incidentally, encourages mass production and consequently the lowering of first cost. Thus it came about that petrol vehicle design and construction rapidly progressed, while the electric vehicle survived almost unchanged. The changes recently introduced in electric

vehicle chassis and bodies are all derived from the petrol car industry, and the impulse towards improvement came from the "disadvantage" of short life inherent in the petrol method.

From the point of view of the undertaking or firm which merely wants to distribute its goods in the most economical way, the fact that a vehicle is old-fashioned is no drawback. But psychological as well as financial factors operate in this field as in others. The desire to have every item of equipment in line with the latest fashion is general, and it is strong enough to make buyers feel more inclined towards a brand new petrol vehicle with all the latest modifications than towards electric vehicles which are not undergoing rapid evolution. Nothing could prove the efficiency of the electric vehicle more convincing than the retention of "ancient" electrics by progressive London firms, but it must be confessed that in the eyes of the public the retention of these survivals does not suggest progress. Not only in connection with women and millinery is the love of change a dominating emotion and a source of extravagance.

Long Life : Short Range

It was necessary, however, for the electric vehicle salesman to emphasise the long life of his vehicles. He had to sell an article which was very much more expensive than its petrol counterpart and, of course, still more costly than a horsed vehicle. His crowning argument was that in the long run—ten, twenty years—the user would be better off than he could be with any other mode of transport. Although it was his crowning argument, it was an exceedingly difficult one to make really operative in the average mind. Very few people are so constituted that they prefer to invest one large sum in place of a series of small ones. If they do exercise such a preference it is because they are bolder and more farsighted than their fellows, who feel much safer and happier when they are wasting money year by year in moderate amounts than when they are laying out large sums in the hope of ultimate gain. This psychological characteristic is strengthened by the necessity in most cases of obtaining the consent of a board or committee to the expenditure involved.

Another factor which ought to be mentioned, though it is of minor importance, is the limited range of the electric vehicle. In the early days of battery traction, picturesque efforts were made to launch the electric vehicle on the highways, with charging stations at intervals. These efforts were inspired less by a rational conviction that the electric vehicle was adapted to such performances than by a desire to obscure what was an essential limitation in comparison with rival forms of transport. Everybody is aware nowadays that limited range is not a drawback when the electric vehicle is used in its appropriate service; limited range is, indeed, a cardinal feature of the service itself. Nevertheless this knowledge does not prevent people, and especially engineers, from feeling that battery haulage is a rather crippled form of transport. Although the possession of an unlimited range would not do the electric vehicle any good in the field where it is supreme, there is not an electrical engineer who would not feel stimulated by the invention of some means of giving the electric a roving commission.

A "Petrol Complex"

As it is the prevailing impression that progress in engineering is determined by economic factors, the argument that the career of the electric vehicle was and still is controlled by psychological factors is bound to meet with a high initial resistance. Nevertheless it affords the only adequate explanation of the chronic indifference of the electrical world to the unique advantages of battery traction. And the reluctance to admit the influence of human weaknesses in this connection may be diminished by observing the operation of the same sort of factors in the development of the trolley bus. From the point of view of the travelling public the trolley bus is far superior to the motor bus; from the point of view of the operator and the owner the case for the trolley bus is impregnable. Yet the advocates of the trolley bus meet with a stubborn opposition from many *electrical* engineers.

How are we to account for this opposition save on the ground that electrical engineers are subject to a "petrol complex"? Apart from the merits of the case one would, on general principles, expect electrical engineers to be biased by their enthusiasm in favour of their own profession. Propaganda for the trolley bus ought to be superfluous among electrical engineers, but as things are it is a necessity, and an arduous and rather disheartening one. It is met with assertions about the "superior mobility" of the motor bus, although motor bus services in towns are rigidly restricted to certain traffic routes. The utmost is made of difficulties of overtaking and of getting breakdowns out of the way; the means adopted for overcoming these minor difficulties are treated with polite scepticism. In short the electrical engineer feels, without quite knowing why, that he would be happier with a fleet of alien motor omnibuses than with vehicles which are wholly electric. He would certainly be surprised to learn that the virtual silence of the trolley bus, which is such a boon to the public, reacts against it in his inner mind. Noise is associated with power and speed—two qualities which impress everybody, and engineers more than others. Much of the thrill of a Brooklands race meeting is due to the roar of unmuffled exhausts; much of the joy of possessing a sports car has gone since a standard of quietness was imposed. It is highly significant that the suppression of noise had to be imposed upon motorists. The racket that drove the public to distraction was music in their ears—music that gave them a stimulating sensation of the exuberant energy they controlled.

There remains the question of how the psychological factors which have impeded the progress of the electric vehicle are to be overcome. This is, admittedly, not an easy question to answer, since the factors concerned are deep-rooted and of long standing. On the other hand, the first step towards the solution of a problem is a clear understanding of the nature of the problem. If the electric vehicle industry realises that it has to deal with a state of mind formed by various emotional influences it has at least cleared the way for effective action. For a generation or so it has relied upon facts and figures, and the result has been a meagre crop of 5,000 vehicles; now it must change its tactics and seek a way of curing the instinctive obsessions of the potential user.

The subjects for the first experiment are undoubtedly the supply engineers. Their conversion is an essential preliminary to developments among trade and other users, who at present can meet the electric vehicle salesman with the argument that he is asking them to use a form of transport ignored by electrical engineers themselves. Their influence upon public opinion is great and their numbers are small—so small that an organised attack upon their petrol complexes and their inhibitions would not be costly. It would nevertheless call for the utmost measure of persistence, concentration. and imaginative skill, since nothing less than a revolution will bring the supply engineer to a proper sense of the scandalous anomaly presented by his use of petrol vehicles where electric vehicles would do the work far more efficiently and would provide the foundation for an invaluable improvement in the magnitude and character of his station load.

Analysing High-speed Operations

THE stroboscope is being utilised increasingly for industrial speed measurement, for analysing high-speed operations, and for photography, as it produces the optical effect of slowing down a motion, or even of stopping it.

In the accompanying photograph an instrument of this type, termed the "Strobotac," produced by the American General Radio Co., of Cambridge (Mass.) is shown in use for the final adjustment of the cutters of electric shavers. When any high-speed mechanism is thus viewed, irregularities in the original motion are made visible.

The "Strobotac" in use

The fact that a moving part is apparently motionless when viewed under light flashing at the same rate of speed gives such an instrument a second field of utility for accurate speed measurement, with the advantages that in the case of small mechanisms no contact with the machine is required, power is not absorbed and, moreover, the speed of parts which would be inaccessible by other methods can always be measured in this way provided the stroboscopic light can be flashed upon them.

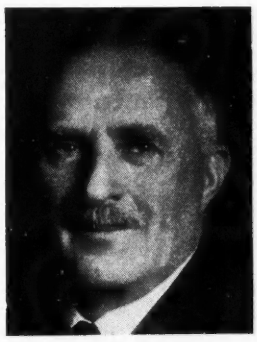
The instrument has a speed scale graduated directly in RPM from 600 to 14,400, in two bands, the lower from 600 to 3,600, and the upper from 2,400 to 14,400. The device is portable, weighing only 10 lb., and is designed with the flashing controls on the right, so that when the instrument is held in the left hand the speed can be readily controlled by the right, and the reading taken from the top of the instrument. Accuracy of the order of ± 1 per cent. is obtainable by this means when the instrument is energised from mains suitable for synchronous electric clocks. It is, however, claimed that ± 0.1 per cent. is possible under some conditions.

THE I.M.E.A.

Forty-fifth Annual Report

WE reported in our last issue that it had been found necessary to postpone for an indefinite period the annual general meeting of the Incorporated Municipal Electrical Association which was to have been held on May 30th. The annual report, however, had been circulated to members and we had a copy. We were told that this remained confidential until the meeting was held, but, unfortunately, an abstract of the report was published elsewhere last week. This explains why the summary of the report which appears below is apparently a week late.

The report is the Association's forty-fifth and covers the twelve months ended March 31st last. The Association, with a membership of 338, now represents 92 per cent. of the municipal supply undertakings of the country. Two new members are Barry U.D.C. and the Borough of Macclesfield. The Borough of Ruthin has resigned.



Mr. B. Handley, president-elect of the I.M.E.A.

A review is given in the report of the work of the Association during the past year including its activities on the Joint Committee of Electricity Supply Associations and the Conjoint Conference of Public Utility Associations and its collaboration with other bodies in the electrical industry.

Among the principal items in the report is a reference to negotiations with the Central Electricity Board regarding the position of undertakings taking a supply from the grid at two points. The Board has expressed the view that the supply authority should not be penalised as to its maximum demand at one point in the event of interruption of supply at another. In other cases the second point of supply would be charged separately at the grid tariff. For the purpose of dealing with difficulties in connection with charges for bulk supplies from the grid via the mains of another undertaking, Messrs. Kennedy & Donkin have been asked to investigate the position. The Council regards it as essential that the terms upon which undertakings receive their bulk supplies should be disclosed.

Inquiry of the Inland Revenue Department has elicited that boilers used for generation are to be included in the figure upon which wear and tear is calculated at the rate of 6¼ per cent.

At a conference with the G.P.O. the Ministry of Transport and the Electricity Commissioners it was agreed that present legal disabilities ought to be removed so that undertakings could arrange with licensed bodies to broadcast programmes over their distributors. The Council is pressing for powers to allow undertakings themselves to operate such a service.

As the power factor of the ordinary AC motor is stated not to exceed 0.87 on full load, it was suggested that standard designs for a higher value should be introduced. The B.E.A.M.A. is of the opinion that existing standards are a good compromise between price, efficiency and power factor and compare favourably with Continental and American practice. The Council welcomes the proposed relaxations of the Electricity Commissioners' Overhead Line Regulations which were under consideration before the outbreak of war with a view to reducing the cost to undertakings of giving supplies to rural areas.*

Restrictions on Expenditure

Reference is made to a circular issued by the Electricity Commissioners (February 20th) that restrictions on capital expenditure are not intended to affect the meeting, so far as practicable, of reasonable domestic and commercial demands or the statutory obligations of the undertakings. Attention is drawn to an instance (one of many in which discrimination has been made against electricity recently by Government Departments) where a War Office specification for buildings precluded the use of electric cookers and wash boilers.

Representations have been made to the Minister of Transport urging that claims in respect of damage to the property of electricity undertakings by trailing ropes of barrage balloons should be settled now instead of after the war. Damage to property of supply undertakings due to enemy action would usually have to be made good immediately, but the cost of doing so might be beyond the resources of individual undertakings. The Government has therefore agreed that this cost should fall upon the community as a whole. The Association has assented to the principle embodied in a memorandum by the late Mr. W. B. Woodhouse for spreading the burden until compensation can be obtained from public funds.†

Studies by the I.M.E.A.-E.L.M.A. Joint Committee have shown that extinction of mercury discharge lamps due to voltage surges has been experienced only in isolated cases and that with recent technical developments the trouble is now much less pronounced.

The Joint Committee has also made representations to the Home Office that the recommendations contained in the Fourth Report of the Departmental Committee on Lighting in Factories should be made mandatory forthwith by Order in Council and that minimum illumination values for specific tasks should be based on the upper part of the appropriate range of the code of the Illuminating Engineering Society. It is considered that undertakings with facilities to extinguish public lighting on receipt of an air-raid warning should be permitted to give a higher level of illumination than at present.

The Conjoint Conference of Public Utility Associations opposed the London Rating (Sites Values) Bill, the object of which was to provide for the rating of unoccupied premises, and the Bill was rejected by the House of Commons. Its provisions would have borne hardly on London undertakings and the principle would no doubt have been extended to the whole country. The Conference also succeeded in obtaining exemption from the armament profits duty, had that duty remained in force, and in bringing about the withdrawal of the rationing of electricity and gas.

A Committee of both Houses of Parliament accepted the contention of the Joint Conference that the cost of sub-surface works should be borne by the party initiating a proposal to alter a highway or a bridge or level crossing. Legislation would be necessary to give effect to this and in the meantime the necessary provisions should be incorporated in Bills and Orders promoted by undertakings.

Notices of Motion

Included in the agenda for the postponed meeting were four motions by members. One of these called for an alternative to the grid tariff, basing the annual kW charge on the average m.d. of the first and last two months of the year. Another sought to secure permission from the Electricity Commissioners to install Diesel plant for stand-by local generation in the event of damage to a single transmission line giving a bulk supply. A third proposal was that expenses of attending meetings of the Executive Committee or Sub-Committees of Centres should be borne proportionately by all members of the Association instead of by the local authorities concerned. The fourth resolution related to fuel rationing and urged that if it were reintroduced regard should be paid to the value of electricity for household heating especially if, owing to transport difficulties, solid fuel was not available.

We gather from the Association that the present Council will continue in office until the annual meeting takes place. Mr. B. Handley, city electrical engineer of Portsmouth, is the president-elect.

* Mr. Grimmitt refers to this matter in his article on page 606.

† *Vide* ELEC. REV., February 16th (p. 185).

Paper Drying Investigations

THE nature of the drying process in paper, as determined by electrical methods, is discussed in an official communication from the Electrical Research Association (report ref. A/T72) published in the *I.E.E. Journal* for April. Apparatus is described that permits the drying process to be investigated at high vacua, and is sufficiently sensitive to measure the electrical changes due to a water content of the order of 0.05 per cent. of the weight of cellulose present.

Experimental data indicate that at temperatures at least as low as 60 deg. C. paper can be brought to a state of complete dryness by the circulation of dry air at atmospheric pressure. Reduction of pressure, while it greatly accelerates the process, does not affect the final result. The conception of residual moisture does not, therefore, apply if the ambient atmosphere is perfectly dry. The equilibria, dependent upon pressure, found by American investigators are probably due to the existence of a partial pressure of water vapour in the atmosphere of their experiments.

Paper in the perfectly dry state shows the electrical characteristics of a polar substance, possessing dielectric losses and a capacitance dependent upon temperature and frequency. Provided correct allowance is made for the residual values pertaining to the paper itself, either the loss angle or the frequency change of capacitance may be used as an indication of the amount of water present. The polarisation of water adsorbed on cellulose is roughly three times less than the polarisability of water in the gaseous state, and 20 times less than that of liquid water. The dielectric loss of water adsorbed on cellulose depends upon temperature and frequency in such a way as to suggest that both polar and ionic loss mechanisms are present.

I.M.E.A. ACTIVITIES

Wartime Problems Considered

A MEMBER of the Incorporated Municipal Electrical Association has been in communication with the Joint Committee of Electricity Supply Associations with regard to the question of grants in respect of A.R.P. expenditure at generating stations. It is understood that the Central Electricity Board refuses to accept responsibility for A.R.P. expenditure as a generating charge and therefore the cost of protective methods becomes a charge against distribution. Thus, it is contended, the distribution system of an owner of a selected station is saddled with the whole of the cost of A.R.P. measures while other undertakings supplied by the Central Board escape such charges. The Electricity Commissioners point out that these undertakings will, however, ultimately have to meet (through the grid tariff) an appropriate proportion of the Central Board's A.R.P. expenditure in connection with the grid.

Under Sections 38 and 42 of the Civil Defence Act some of the items of A.R.P. expenditure should qualify for a grant and members of the Association are asked to send the secretary a list of items which they consider should come under this head. The information will then be collated, and, should it be deemed necessary, an approach will be made to the Electricity Commissioners.

A.R.P. Grants

The Commissioners were recently asked to state which items at present ranked for grant under Section 44 of the Act and whether the form of application in respect of grants under Section 38 was yet available. In the course of their reply the Commissioners made a comparison of certain decisions set out in their letter of August 3rd, 1938, with the provisions of the Civil Defence Act, showing that certain items which it was formerly considered should be borne by the undertakings were now eligible for grant. Certain special cases involving heavy expenditure might also come under that head. Such special measures include the provision of 14-in. brick walls in front of outdoor transformer banks at important generating stations and substations situated in vulnerable areas; the replacement of glass roofs in important switch-rooms and control rooms by 5-in. concrete; and the provision of duplicate control rooms where they can be justified on defence grounds (only one-half of the cost to rank as an "approved expense"). The form of application for grant under Section 38 of the Act was expected to be available very shortly.

Certain electric cooker manufacturers asked the Joint Committee in March to assist in making representations to the Government in the event of the imposition of restrictions upon materials making it necessary to curtail or even preclude the manufacture of new goods for home consumption, in particular the manufacture of electric cookers. The Committee suggested that the report might be forwarded to the manufacturers' individual customers

Price Variation Clause

The Joint Committee has also had under consideration a proposal that undertakings should include a price increase clause in contracts for the supply of electricity to Government Departments. The Committee expressed the opinion that the clause was not an appropriate one for inclusion in electricity supply agreements and that the question was one for determination by individual undertakings.

It is understood by the Association that the Air Ministry is now prepared to entertain claims, under certain conditions, for *ex gratia* payments of compensation in respect of damage caused to transmission lines, &c., by barrage balloons, if not due to enemy action.

The Joint Committee of Electricity Supply Associations has under consideration a draft scheme for the spreading of the burden of war damage until such time as compensation from public funds is available. A deputation of electricity, gas and water interests waited upon the Treasury last month for the purpose of ascertaining the Government's intentions in connection with this matter.

The suggestion that hire-purchase agreements might be transferred from one undertaking to another upon the removal of consumers has been acted upon and quite a large number of members of the Association have already in operation a scheme providing for these transfers. The Council proposes to prepare a register of those undertakings which agree to participate on a reciprocal basis in the scheme.

New I.E.E. President

Mr. J. R. Beard's Career

AT a time when the duties of the Institution of Electrical Engineers are enlarged beyond the normal scope to ensure that the whole weight of training and experience of its members shall be behind the allied war effort, the lot has fallen on Mr. James Robert Beard, M.Sc., to guide its policy from October next when he will succeed to the presidential chair. Whatever may be the situation then, there can be no doubt that it will be such as to test to the full the adaptability of the Institution to meet conditions far more onerous than its founders could have envisaged sixty-nine years ago.

Mr. J. R. Beard

In numerous addresses and papers presented before the Institution and other technical bodies at home and abroad, as well as in his work, Mr. Beard has shown himself to be possessed of the essential qualities for the premier position of his profession. In these are included a full share of the prescience that custom has attributed to the Manchester man, a wide outlook on the innumerable problems of the industry and a long experience in electrical transmission and distribution which his close association with the design and construction of the national grid system has intensified. Like his predecessor in office, Mr. Beard gained experience early in his career on the North-East Coast, where many developments of a pioneering character were being carried out.

Born in 1875, he was educated at Manchester Grammar School. After studying engineering at the Victoria University of Manchester, he joined the staff of the Newcastle Electric Supply Co. and later went to the Cleveland and Durham Electric Power Co., both subsequently merged in the North-Eastern Electric Supply Co. Since 1930 he has been a partner in Messrs. Merz and McLellan, consulting engineers, with whom he had been for several years previously.

Mr. Beard became an A.M.I.E.E. in 1912 and a M.I.E.E. in 1918. In 1920 he was chairman of the North-Eastern Centre. He has served for two periods on the Council (1927-30 and 1934 to the present time) and was elected vice-president in 1937. He was also awarded the Institution Premium a few years ago. Other activities have included membership of various committees of the British Standards Institution and the Electrical Research Association and presidency for two years (1937-1939) of the Association of Supervising Electrical Engineers. The Merz-Beard protection system testifies to his inventive ability.

Our wish that Mr. Beard's term of office may be as successful as he would desire is coupled with the earnest hope that, before its end, electrical engineers will once more be engaged in their normal beneficent functions of advancing human happiness.

Consulting Engineers

THE annual report of the Committee of the Association of Consulting Engineers for the twelve months ended April, 1940, records five resignations and fifteen new elections, raising the membership to 151—the largest in the Association's twenty-seven years' existence. Income was slightly greater, but expenditure was not increased. Last year the then chairman, Mr. C. G. du Cane, was called upon to make 26 nominations in response to inquiries for the services of consultants, five fewer than in the previous year.

Amendments of the Articles of Association which have received the approval of the Board of Trade will, among other things, permit the election of consulting engineers who, though qualified, have not hitherto been eligible, and also tighten up disqualification resulting from connection with manufacturing firms.

The secretarial staff has now returned after temporary evacuation to 214, Abbey House, 8, Victoria Street, Westminster, S.W.1.

OVERHEAD LINE PROTECTION

Petersen Arc Suppression Coils

UNTIL recently, British and Continental practice as regards the earthing of electrical networks have been directly opposed to each other, for whereas insulated systems are almost universal on the Continent, British practice is to earth the neutral, either solidly or through a resistance. Within recent years an intermediate policy, of earthing through a

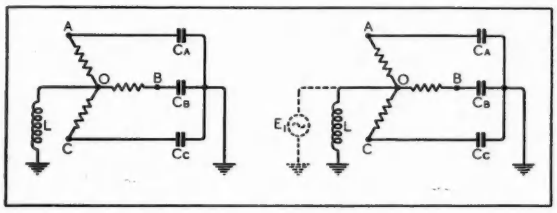


Fig. 1

Fig. 2

protective device commonly known as a Petersen coil, which is, in effect, an oil-immersed choke, has been growing in favour, and a unit, designed and manufactured by the General Electric Co., Ltd., has been in successful commission on an English supply system for the past six months.

Fig. 1 represents a high-voltage transmission system protected by an arc-suppression coil L, which is connected to either a suitable system star-point or through an earthing transformer. The earth capacity of the three h.v. lines is represented by C_A, C_B, C_C, and as these are assumed to be exactly equal they may be represented by C. If there is no earth fault on the system there will be no voltage across the coil L and each capacity has impressed across it $V/\sqrt{3}$, where V is the system line voltage. These are the normal conditions on an ideal system. Now assuming a dead earth fault to occur on line A, the potential to earth of this line is reduced to zero, and the potential to earth of lines B and C is raised from $V/\sqrt{3}$ to V.

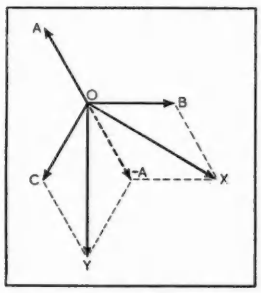


Fig. 3

OA, OB, OC = system phase voltages; −OA = voltage of generator E_1; OX = potential of line B; OY = potential of line C. Potential of line A is zero

An identical potential distribution would be obtained if a single-phase alternator, generating an RMS voltage of $E_1 = V/\sqrt{3}$ and a phase direction −OA is assumed to be connected between neutral and earth, as shown in Fig. 2. It is clear from Fig. 3 that such a generator would reduce line A to earth potential and increase the potential to earth of lines B and C to system voltage V.

The effects of earthing one line can be visualised by reference to Figs. 2 and 3. Neglecting the polyphase system voltage, and considering only the single-phase circuit fed by the generator E_1, Fig. 2 is reduced to the simple equivalent diagram shown in Fig. 4. The current supplied by the generator E_1 will be zero if $\omega L = 1/3\ \omega C$, and the current in the coil L will be $I_L = V/\sqrt{3} \times \omega L$, this current returning through the three capacities C_A, C_B and C_C. As the circuit is in resonance, $I_L = I_C$, and the current in each of the line capacities will be $I_C/3$. Since the current flowing through the coil is equal to the total current flowing through the three capacities and the generator current is zero, it is clear there can be no current in the fault impedance Z_F and the fault current is therefore zero.

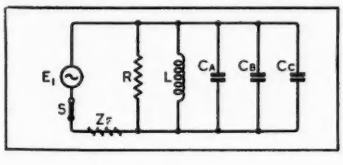


Fig. 4

Although Fig. 4 correctly represents the current conditions relevant to the operation of the coil, this is only an imaginary circuit to facilitate a study of the operation; to obtain the actual current in any part of the circuit the single-phase currents obtained from Fig. 4 must be superimposed upon the polyphase currents already flowing. The polyphase voltage across the coil L is of course zero, and the current through the coil remains unchanged at I_L. Across each of the three capacities there is however the phase voltage $V/\sqrt{3}$, giving the three capacity currents i_A, i_B, i_C, each of RMS value, $\frac{V\omega C}{\sqrt{3}}$ and displaced from one another by 120 degs.

To each of these current must be added $I_C/3$, and since the single-phase current through C_A obtained from Fig. 4 is antiphase to the current i_A the resultant current through C_A is zero. This result is obvious by reference to Fig. 1 when it will be seen that C_A is short-circuited by the earth fault.

Fig. 4 shows that the generator (i.e. earth-fault) current is zero if the coil L is tuned to resonate with 3C at power frequency, but this result cannot be achieved in practice owing to the losses in coil L and the losses in the high-voltage lines. These losses become effective on the occurrence of an earth fault, and they may be represented by an equivalent resistance R connected across the tuned circuit in Fig. 4. The fault current then has a value depending upon R. It is also clear that the fault current is further increased if the circuit is not accurately tuned.

Mode of Arc Suppression

In considering the means by which the coil assists arc extinction it is immediately apparent that the first assisting factor is the reduction of the earth - fault current itself which the coil produces. A second factor which is equally important is the delay in establishing the restriking voltage across the arc space, this delay being due to the peculiar properties of the tuned circuit of which the coil L is a part.

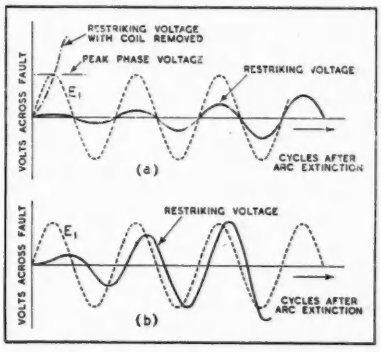


Fig. 5—Growth of re-striking voltage after arc extinction. (a) Coil in tune; (b) coil out of tune

If the current in a circuit is interrupted at any point, a voltage appears across the point of interruption, this voltage tending to restrike the arc. The rate of rise as well as the magnitude of the restriking voltage determine whether the arc will reignite. Referring to Fig. 4, if the generator E_1 is disconnected from the circuit by the switch S, the tuned circuit will continue to oscillate for a number of cycles at power frequency, and the voltage across the tuned circuit will gradually fall from $V/\sqrt{3}$ to zero at a rate depending on the loss resistance R. For a typical coil it may take more than 10 cycles for the coil voltage to reach zero. Since the restriking voltage across S is the difference between the generator voltage and the voltage across the tuned circuit, there is a gradual increase in the restriking voltage and ultimately it reaches a peak value of $\sqrt{2}V/\sqrt{3}$. The important feature is that the restriking voltage is established *slowly* thus permitting the arc path to deionise before the restriking voltage has risen sufficiently to produce reignition of the arc. Fig. 5 (a) illustrates in a general way the enormous reduction in the rate of rise of the restriking voltage compared with the conditions prevailing if the coil was removed.

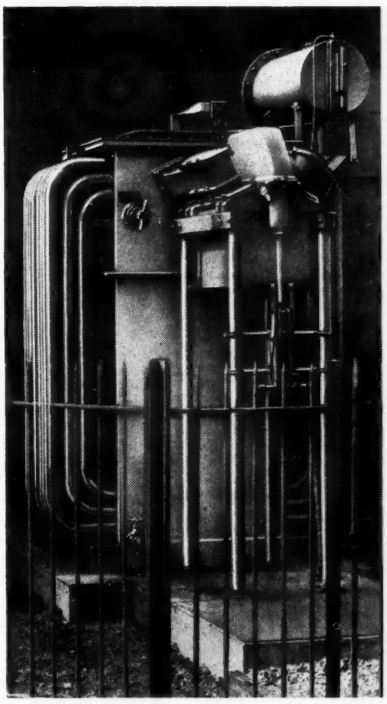


Fig. 6—Typical Petersen coil for 11-kV system

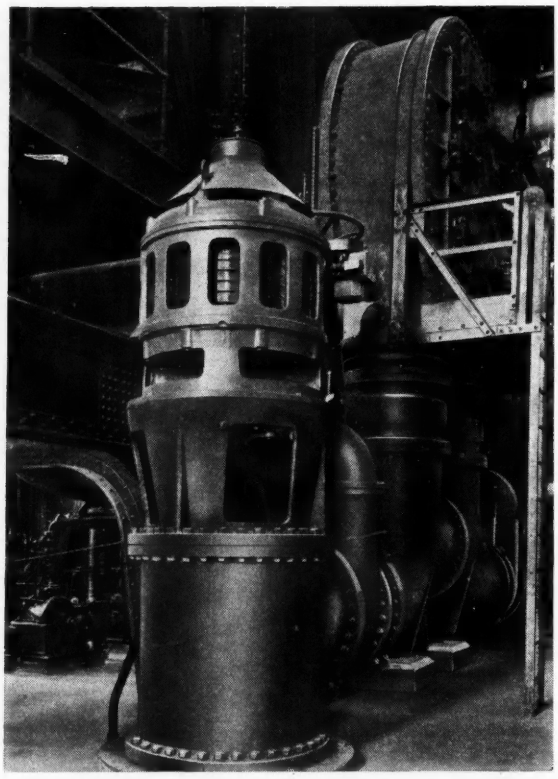
Fig. 5 (b) shows that the rate of rise of the restriking voltage

CONDENSER PUMPING

Trend of Modern Practice

By F. J. Taylor

PUMPS of the centrifugal type for condensers operate on a low head which, while sometimes reaching 35 ft. or more, averages more nearly 15 ft. The relation of the quantity of water dealt with (Q) and the head (H) gives an indication of the size of pump required. By combining Q, H and RPM into a single numerical value—the specific speed—a basis is provided for determining the limits of application of any type.



Axiflo condenser circulating pump (Foster Wheeler)

Pumps of the orthodox centrifugal variety, however, are limited in their relatively low specific speed. This accounts for the increasing trend towards the use of condenser pumps of the mixed-flow, axial-flow and propeller types for all classes of low-lift pumping, especially where the operating head varies. While in the average case the standard centrifugal pump would serve the purpose quite well, it must be borne in mind that, in view of the relatively large amount of power required for water circulation, sustained high efficiency is essential to secure economical operation.

When laying out the circulating system of a condenser, friction loss must be minimised by taking the piping with the fewest practicable number of bends (and those should be of large radius) to and from the condenser. With this in view a vertical-shaft pump often "works in" better than a horizontal one and facilitates the placing of the pump in a pit to ensure good suction conditions, the motor being at engine-room floor level.

Large American Units

Very large units of this class have been constructed, such as the two of 500-HP with a capacity of 107,000 gals. per min. each at 12 ft. head at the Pekin, Illinois, generating station. In most respects they are merely a large and modified form of the split-casing volute centrifugal with the usual bronze impeller. There are removable bronze bushing rings and the steel shaft is enclosed in removable bronze sleeves which are screwed on the shaft against the impeller and locked against rotation.

The bearings have self-contained oil pumps of the screw type fitted to the shaft which build up the feed pressure through rotation; the sealing glands are of the water pressure type while the weight of the impeller may be carried by the motor thrust bearing or by a special one. The working of this double-suction pump (whether vertical or horizontal) is simple, although for delivering large volumes of water against relatively low heads it is not the most efficient.

Pumps of the mixed-flow class which retain the volute casing are exemplified by a type having an end suction and an impeller of modified screw form resembling a Francis hydraulic turbine reversed. It is claimed by some to combine the advantages of both centrifugal and axial-flow types for condenser circulation. It has a higher rotative speed for a given capacity and head and a steep head-capacity characteristic, so that the capacity variation is small for a wide variation in head. Such pumps, too, can be started dry and brought up to normal speed before priming, thus permitting low starting-torque drives. A mixed-flow pump can also be fitted with an impeller having a relatively flat power curve at slightly reduced rotative speeds; it is suitable for any form of drive and may be vertical or horizontal.

Axial- or parallel-flow pumps have proved of late to be very suitable for condensers. Two 19,000-gal. per min. pumps serving a 20,300 sq. ft. condenser of a 25,000-kW generating set absorb only 150 HP each. Where compactness is important, the pump barrel forms part of the intake tunnel with the driving motor located above the floor, obviating priming. The same general features apply to the Vickers propeller pumps at Tir John North station, Swansea, which was one of the first of the large generating stations in this country to adopt the type. In a later installation at Fulham, the pumps have a capacity of 22,000 gal. per min. each against 24-ft. head with an efficiency of over 90 per cent. throughout the greater part of the range; high efficiency is also maintained over a wide head range without speed variation.

Although similar in general arrangement propeller pumps differ fundamentally from the axial-flow type. With the axial-flow pump, the shut off-power being essentially that required at full load, a standard motor may be selected for normal operation at its maximum efficiency.

Twin-pump Arrangement

In view of the compactness, simplicity and relatively low cost of an axial-flow pump, there are advantages in equipping a condenser with two, both of which operate in summer while in winter one would carry normal loads, delivering 30 per cent. or so more water efficiently when required. Such pumps can be operated without submersion and are not sensible in any marked degree to cavitation. The heavier capital outlay of two pumps is often justified by the better operating results compared with a single pump operated by a variable-speed motor.

Present day practice points to the general advantage of a pump of any of the types referred to in which variation in either (Q) or (H) does not abnormally increase the power used, i.e., a pump with a flat efficiency curve, whereas varying (Q) in the ordinary type of centrifugal pump brings about disproportionate alteration in the power absorbed. The essential gearing and the lower efficiency of small auxiliary turbines mitigates against their general use unless exhaust steam is required.

While speed variation is obtainable with certain types of motor over a small range, the constant-speed machine still remains the simplest and most efficient. The axial pump has a greater fall in HP beyond the normal duty than the centrifugal, but maintains its efficiency over a much wider head range. At low outputs the power absorbed by the axial pump rises while that of the centrifugal falls. At zero discharge the ratio to that required at normal duty is approximately 1.7 :1 for the axial-flow pump and 0.45 :1 for the centrifugal pump.

Overhead Line Protection (*Concluded from preceding page*)

is much affected by the accuracy of tuning and a deviation from resonance of 10 per cent. is sufficient to increase the magnitude of the restriking voltage by nearly 100 per cent. throughout a period of ten cycles. The peak value of the restriking voltage cannot exceed $\sqrt{2}\times 2V/\sqrt{3}$, and although accuracy of tuning is desirable tests have shown that the coil will operate quite satisfactorily if this condition is not fulfilled, since even under conditions of dissonance the restriking voltage still rises comparatively slowly.

A typical coil is illustrated in fig. 6; this coil is rated for 75 to 135 A. for use on an 11-kV system, and the length of line protected is approximately 240 miles of which 83 miles is underground cable. During a period of six months twenty-eight earth faults were registered, when the fault was successfully cleared by the coil without any interruption whatsoever to the supply, such faults being due to the earthing of phase wires by birds, tree branches, &c.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

AT a recent meeting of the Belfast branch of the Electrical Contractors' Association, **Mr. F. B. M'Ginley** was elected chairman, and **Mr. E. N. Kidd** vice-chairman.

The Minister of Transport has, with the concurrence of the Board of Trade, appointed **Sir Leonard Pearce**, C.B.E., D.Sc., M.Inst.C.E., M.I.Mech.E., M.I.E.E., to be an Electricity Commissioner for part-time duties. Sir Leonard, who is the engineer-in-chief of the London Power Co., and who has previously served as an Electricity Commissioner, was for many years the chief engineer and manager of the Electricity Department of the Manchester Corporation.

Sir Leonard Pearce

Mr. G. H. H. Watson, who has been district representative of the Shropshire, Worcestershire and Staffordshire Electric Power Co. in Hereford since the company took over the Corporation undertaking ten years ago and had been with the Hereford Electricity Department practically since its inception, retired on May 31st. To mark the occasion he has been presented with a silver teapot and watch.

Mr. E. J. Buckton, B.Sc., M.Inst.C.E. (Rendel, Palmer & Tritton) is the new chairman of the Association of Consulting Engineers.

Sir Alexander Roger, who has been appointed chairman of the Tank Board set up by the Minister of Supply, is chairman of British Insulated Cables, Ltd., and a director of a number of other electrical companies. The members of the board include **Mr. A. A. M. Durrant,** a chief engineer with the London Passenger Transport Board.

Major H. Richardson, M.C., M.I.E.E., has been appointed chairman of the London Electricity Supply Association.

A football match recently took place between the North-West Midlands Joint Electricity Authority and the Stoke-on-Trent Corporation Electricity Department. The match aroused considerable enthusiasm, and after a close game the J.E.A. team was victorious by one goal to nil. The accompanying picture, taken during the afternoon, shows that interest in the game was not confined only to the male members of these authorities.

Footballers who took part in the recent match between the N.W. Midlands J.E.A. and Stoke-on-Trent Electricity Department

Mr. G. J. Macdonald, M.I.E.E., has been appointed by the Portsmouth Education Committee as head of the Electrical Engineering Department of the Municipal College, in succession to **Mr. G. D. Aspinall Parr,** M.Sc., who is retiring at the end of the present session.

Mr. C. W. Marshall, B.Sc., of the Central Electricity Board, has been nominated for the chairmanship of the Meter and Instrument Section of the Institution of Electrical Engineers for the 1940-41 session.

Derby Electricity Committee has recommended that **Mr. W. Warren,** A.M.I.E.E., A.M.I.Mech.E., be appointed deputy borough electrical engineer in succession to **Mr. J. A. Sumner,** who has been appointed chief electrical engineer at Norwich. Mr. Warren has been in the service of Derby Corporation since December, 1926, as generation engineer and power house superintendent. He first went to Derby as a representative of International Combustion, Ltd., to supervise the pulverised fuel installation at the electricity works.

Mr. H. C. Harrison has resigned his position as managing director of Durham Cables, Ltd., and has severed his connection with the company. His private address is "Cotehill," Lyndhurst Drive, Low Fell, Gateshead. **Messrs. A. C. J. Burningham** and **D. MacQuarrie** have joined the staff of Durham Cables, Ltd., as commercial manager and works manager, respectively.

Hornsey Town Council has decided to merge the electrical sales and consumers' departments, and **Mr. L. Compton,** chief assistant installation engineer, is being appointed to manage the central showrooms and to carry out consumers' installation work in collaboration with the consumers' engineer.

Sir George Julius has retired from the position of chairman of the Standards Association of Australia, and he has been succeeded by **Mr. A. J. Gibson.**

Mr. W. J. Picken has been elected chairman of the Wireless Section of the Institution of Electrical Engineers, no nominations having been received other than that proposed by the Section Committee.

Mr. G. E. Bailey, a director of Associated Electrical Industries, Ltd., has been elected president of the Engineering and Allied Employers' National Federation in succession to **Sir Charles Craven,** who resigned following his recent appointment as civil member of the Air Council for Development and Production.

Sir Frank E. Smith has been appointed Controller of Telecommunications Equipment by the Minister of Aircraft Production.

We recently reported that **Major F. Springate** had been appointed chief electrical engineer at Tonbridge, provided he could be released from military service. It is now announced that the position is to be held for the duration of the war by **Mr. S. Cameron Gibson,** who has just retired from the post of borough electrical engineer of Nuneaton.

Mr. T. E. Roles, who is shortly retiring from the position of city electrical engineer of Bradford, is to receive a pension of £375 a year.

The fifty-eighth annual general meeting of the London Chamber of Commerce was to be held yesterday (Thursday), at which **Sir Alexander Gibb,** G.B.E., F.R.S., was to deliver his presidential address. Sir Alexander Gibb is retiring from the presidency after three years' service, and **Sir Geoffrey R. Clarke,** C.S.I., O.B.E., has been nominated to succeed him. Sir Geoffrey is managing director of the Telegraph Construction & Maintenance Co., Ltd., Selborne Plantation Co., Ltd., and Submarine Cables, Ltd. chairman of the Calcutta Tramways Co., Ltd., and a director of British India Steam Navigation Co., Ltd., and Peninsular & Oriental Steam Navigation Co. He is also a past chairman and deputy-chairman of the Council and is the chairman of the London Postal & Telecommunications Advisory Committee.

Sir Alexander Gibb

Sir Geoffrey R. Clarke

Obituary

Mr. W. Forbes.—We learn with regret of the death of Mr. William Forbes, general manager of the Cardiff Corporation Transport Department, which occurred on May 30th at the age of fifty-seven. Mr. Forbes received his training with the Caledonian Railway Co. (now incorporated in the London, Midland & Scottish Railway), with whom he was later engaged upon railway electrification. In 1909 he went to Aberdeen, where he became general manager and engineer of the transport system. He remained there until 1928, when he was appointed to the Cardiff Transport Department in succession to Mr. R. L. Horsfield. Mr. Forbes had had a wide experience in all matters relating to transport and he had been responsible for the designing and building of tramcars and motor omnibuses, the erection of workshops and garages, and the extension of tramway tracks. His reputation was such that in 1931, although not an applicant, he was asked by the Belfast Tramways Committee to allow his name to go forward for the post of general manager of the Belfast undertaking at a salary of £2,000 a year.

Mr. P. E. Tidby.—We regret to learn of the death on May 30th of Mr. Percy E. Tidby, who was for many years manager of the electrical department of S. G. Allen & Son, electrical contractors, &c., of Gravesend. Mr. Tidby was hon. secretary of the Gravesend branch of the Electrical Contractors' Association. He was fifty-two years of age and leaves a widow.

Mr. R. Duncan.—In his statement on Tuesday last, the Prime Minister mentioned that Mr. Rae Duncan, son of Sir Andrew Duncan, President of the Board of Trade, had been killed in action. It is understood, however, that this has not been officially confirmed.

Mr. John Edmund Ash, of Halifax, whose death is announced at the age of thirty-seven, was assistant engineer with the Halifax Corporation Transport Department.

NEW BOOKS

Factory Management. Switchgear Applications. Practical Welding

Engineering Reorganisation. By James J. Gillespie. Pp. 268; figs. 70. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 12s. 6d.

Scientific methods do not on their own make management, but many concerns still tend to reassure themselves on the efficiency of their management by whether or not they are using the most recently developed tool, quite irrespective of whether or not it happens to be suited to the needs of their particular business.

This tendency is unfortunately encouraged by the fact that so many of the new books on industrial management seem to be written by men more familiar with the library desk than with the workshop bench. Mr. Gillespie is a happy exception, his personal experience ranging from machine operator to management consultant. He knows his subject and he knows how to "put it over."

The book deals with the engineering approach to the reorganisation of factory methods, starting with fundamental measurement and quality control and following with material control, tool control, processing, rate fixing, planning and progressing. The author has developed a technique for the analysis of the practical effectiveness of the various features of industrial management, and planning, costing, research, processing and inspection are all dealt with from this aspect.

This is Mr. Gillespie's fourth book on industrial administration and it is without doubt his best so far.—A. W. W.

American Machinists' Handbook. By F. H. COLVIN and F. A. STANLEY. Seventh edition. Pp. 1,366, illus. McGraw-Hill Publishing Co., Ltd., Aldwych House, London, W.C.2. Price 26s.

Since this book of reference to machine-shop methods first appeared thirty years ago some 300,000 copies are claimed to have been issued. It covers a very wide field indeed, including data for draughtsmen and tool makers, definitions and much other practical information in convenient form for all-round mechanics. One of the most valuable sections serves as a guide to the choice and treatment of metals and other materials, while the last section has the unusual title of "Shop Trigonometry," and usefully treats of a subject not often found in books of reference of this kind, namely, the laying out of angles and polygons, locating hole centres, finding a diameter without the centre, calculating plug centres and similar tool-room problems. —W. O. F.

The Switchgear Handbook. Vol. II. Applications. Edited by W. A. Coates and H. Pearce. Pp. 267; figs. 131. London: Sir Isaac Pitman & Sons, Ltd. Price 21s.

This volume deals almost exclusively with the applications of modern switchgear and, as in the case of the earlier volume (published in 1938) has been prepared by a number of contributors. The book as a whole is a valuable contribution to a branch of engineering now recognised as vitally important and in which there has, until a year or two ago, been little in the way of first-rate literature.

Although much of its contents will be of interest to users of switchgear, its practical value will be much more important to draughtsmen and switchgear engineers concerned with the manufacturing side.

In criticism of details, Chapter I deals with the calculation of short-circuit currents, and while one cannot complain of the accuracy of the methods demonstrated, it is reasonable to say that the presentation could have been clearer. The author of this chapter no doubt has his subject at his finger tips, but his presentation has been complicated by the use of a very considerable use of letters from the alphabet, the significance of which is not always apparent and which tend to fog the reader.

In his presentation of the use of symmetrical components, the author states that "the method of symmetrical components is based on the properties of a vector which will be denoted by k." This adds one more letter to the many now in use to denote the unit three-phase vector, a and h already being extensively used.

A list of abbreviations is given at the beginning of the book, some of which are fearsome looking to a beginner as, for example, "Ociter" or "Uvncrel." As most of these belong to Chapter IV, "Circuit Equipment," it would have better had the list been included in this chapter if only to obviate constant reference back when studying the many diagrams in this chapter. On pages 77 and 255, the reader is referred to the "Protective Gear Handbook," but it is not clear whether this yet exists (I believe that at the time of writing it does not).

A statement (page 163) that the maximum short-circuit rating of the breakers which can be economically accommodated in vertical isolation units is 150 MVA may be vigorously disputed. Incidentally, the distinction between this description and that called "vertical drop-down" on page 144 is not obvious. The illustrations, particularly the diagrams, are excellently produced, but a small error occurs on page 167, where the reader is referred to fig. 72 instead of fig. 78.—R. L.

Philips' Practical Welding Course. Pp. 102; figs. 108. London: Philips Industrial, Ltd., Century House, Shaftesbury Avenue, W.C.2. Price 3s. 6d. (Special terms for quantities.)

The purpose of this book is four-fold: to assist the student to obtain a clear and practical understanding of all the factors involved in the arc welding of metals; to provide the instructor with a source of reference and a means to implement his teaching; to widen the knowledge of the experienced operator regarding factors not directly concerned with actual welding but having an important bearing on results (e.g., metallurgy or of the effects of heat on metals); to aid those having executive responsibility for the work of a welding shop.

Its thirteen chapters cover practically every phase of arc welding in logical sequence. A review of welding methods is followed by a brief discussion of the fundamental electrical principles involved and of the types of equipment available. A chapter on the metallurgy of steel and cast iron is followed by three on welding practice. Then follow sections devoted to cast-iron welding, metallography and examination of weld metal and the costing of welding work. Eighteen appendices of welding data and mathematical and other tables are included.—C. O. B.

Electric Wiring (Domestic). Vol I, "Electrical Engineer" series. Edited by E. Molloy. George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Price 5s.

This book is intended for young men engaged in electrical wiring and contracting, and for service and maintenance engineers in works and factories or employed by supply undertakings. Elementary theory is taken for granted, and the book begins with a chapter on circuits. This is mainly occupied by diagrams and illustrations, which gives a disconnected effect to the scanty text, and the phrasing, too, is occasionally loose.

Various wiring systems are then described and there is an interesting chapter on "Wiring a Small House for Electric Light," which describes what is frankly labelled as a cheap competitive job. Chapters on special service and switching points, earthing and the alternative all-insulated system complete the book.

This book would have been better with a fuller text and fewer full-page photographs of wiremen carrying out sundry operations which could easily have been explained by a few words or a simple diagram. The "human angle" is better suited to a popular picture paper than to a technical book, however elementary. —H.R.T.

Practical Design of Small Motors and Transformers. Vol. II of foregoing series.

The title of this volume is somewhat inadequate, as it not only covers design but also the practical construction of small motors and transformers. Its appeal is essentially to the amateur constructor, although the student will find the chapters on design a useful starting point on which to base further study, and the constructional chapters contain a number of useful points. No attempt has been made to cover the whole field of small motors either in design or construction. Within its scope this book may be recommended as being well produced and instructive.—S. F. P.

Maintenance of Electric Motors. Vol. III of foregoing series.

Maintenance engineers whose work includes the supervision of electric motors and who have little or no electrical knowledge will find this book of special interest. Besides the electrical work involved in installing and maintaining motors, all the mechanical details are fully described.

In the chapter on installing small motors considerable attention is paid to cost, and approximate figures are quoted to demonstrate how the price of auxiliary equipment can be limited. There are circuit diagrams for connecting up induction motors and DC machines, and points to be inspected on receiving new machines are mentioned. The section of the book on installation concludes with directions for the starting of motors. The instructions given for cleaning and general maintenance are thorough.

The claim of the editor to have produced a practical treatise seems justified and the grave mistake of recommending inexperienced men to attempt highly skilled work has been avoided.—R. A. J.

Wireless. By C. L. Boltz. Pp. 278; figs. 128. John Gifford, Ltd., 111, Charing Cross Road, London, W.C.2. Price 10s. 6d.

The author has endeavoured to present an explanatory account of some of the more basic foundations underlying radio reception. He uses simple language and keeps to general principles, rather than risk being "outmoded" by any attempt to deal with changing practical details.

Nearly one-third of the book is concerned with elementary facts about electricity and wave-transference of energy. Valve detection and amplification, loud speakers and receiving circuits (straight, superhet. and short wave) are then dealt with, while the last two chapters are devoted to the gramophone and to television.

The author's earlier book on wireless was for "everyman"; the present volume assumes the reader to be familiar with mathematics, up to simple equations, and with symbols.—W.O.F.

Shorter Notices

"Odd Numbers, or Arithmetic Revisited." By Herbert McKay (pp. 215). Cambridge University Press, 200, Euston Road, N.W.1. Price 7s. 6d.—It is only a select few who can really derive pleasure from arithmetic; its subtle charm eludes the rest. This is a book which should do much to convert the latter to an appreciation of the significance of numbers. Lucid explanations of such matters as involution, evolution, logarithms, averages, approximations and triangles are garnished with piquant illustrations and witty comment. Among other things, Mr. McKay takes H. G. Wells to task for a sad miscalculation regarding lunar gravitation which has been repeated in numerous editions of "The First Men in the Moon."—J. H. C.

"Television Receiving Equipment." By W. T. Cocking of the *Wireless World*. Pp. 298; illustrated. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 7s. 6d.

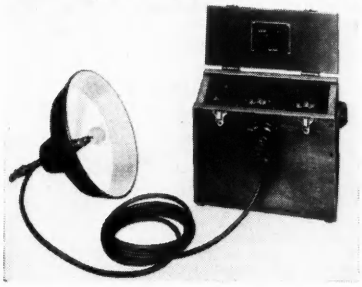
NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

A.R.P. Lighting Equipment

IN the lighting of A.R.P. shelters, &c., it is important that there should be emergency equipment entirely independent of the town supply and ready for immediate operation in case of failure at the generating station. To meet this requirement BRITANNIA BATTERIES, LTD., Redditch, Worcs, have introduced a number of portable lighting sets operated by an "Alklum" alkaline battery, which is especially suitable for such purposes since it has the characteristic of maintaining its full charge during long periods of idleness. Further, these batteries are virtually indestructible owing to the robust nature of their construction.

The set illustrated has been specially designed for lighting small shelters, staircases, and doorways, and for applications where a convenient and transportable type of lighting set is essential. The lamp consists of a large diameter reflector constructed of stout sheet steel with vitreous enamel finish and fitted with a 12-W bulb, giving a well distributed light over a wide area. It is provided with a hook for suspension in any convenient situation and 12 ft. of heavy gauge cab-tyre cable complete with a two-pin plug. The battery is capable of maintaining seven hours' light on one charge, and the whole equipment is supplied in a steel or wooden box fitted with hinged



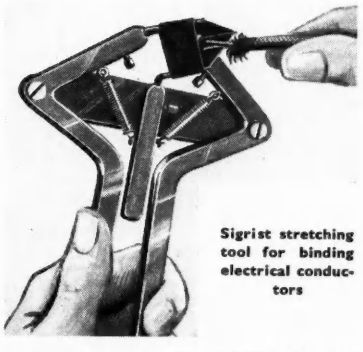
"Britannia" A.R.P. lighting set

lid, clasp fasteners, carrying handle, switch and plug socket.

Binding Conductors

In view of the increasing use of rubber sleeves for binding and insulating electrical conductors, an improved model stretching tool brought out by E. SIGRIST, 39, Berners Street, W.1, is of particular interest. The strongly constructed body is of chromium plated steel and a special feature is the facility provided for readily replacing the prongs should they become damaged. As the prongs are of a special high-strength alloy breakages are, however, rare.

Two sizes of tool are available, as well as a bench machine which can, if desired, be operated by means of a foot treadle. The instrument is British-



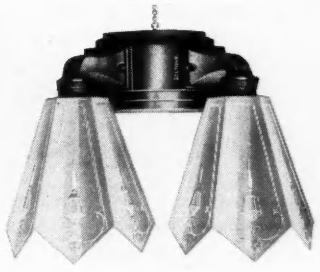
Sigrist stretching tool for binding electrical conductors

made and carries a two years' guarantee. The company also supplies the special rubber tubing and cones required in twelve stock sizes and fifteen different colours, identification wording being printed on them if required. A skilled worker can fit 1,200 tubes an hour.

Lighting Fittings for Export

A range of lighting fittings for the export market is now being produced by WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester. They include globe fittings for wall and ceiling mounting, supplied in various finishes to match surroundings. These units are screwed to take the opal glass globe, and as they are provided with rubber gaskets to prevent entrance of moisture, they are suitable for outdoor as well as indoor use.

Another interesting fitting is a twin-light wall bracket of plastic construction. Of attractive modern design, it is supplied complete with three-way chain controlled switch, providing one or two light illumination and "off" position. It can also be supplied without the switch. The

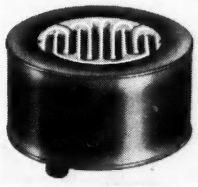


Ward & Goldstone twin-light wall fitting

brackets are obtainable in walnut, mahogany, oak and white finishes, the shades being of white opal finish.

Boiling Ring

The model "L5" boiling ring made by ELECTROWAY HEATERS, LTD., Sparrow Hill, Loughborough, has an open "Nichrome V" spiral in grooves in the upper surface of a refractory disc. This is supported in a cylindrical ventilated sheet-steel case mounted on three wooden feet. The loading is 750 W.



Electroway boiling ring

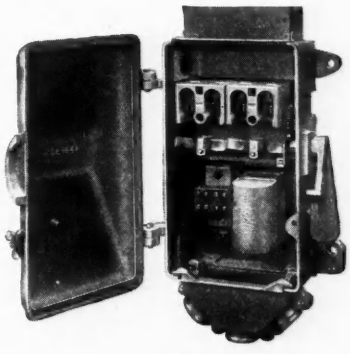
Ironclad Switch-fuse Unit

The "Sheffield" ironclad switch-fuse unit has been designed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, with the dual object of preventing theft of electricity and also of providing separate control and metering for lighting, heating and power circuits. The new unit is suitable for single-phase services up to 60 A, 250 V.

The main unit consists of a 60-A double-pole switch, a single-pole 60-A fuseholder and base to accommodate an h.r.c. cartridge fuse, and a multiple terminal block for the neutral; the ends of the cast-iron case are open at top and bottom. A separate shroud fits over the meter terminal box after connecting and is locked in position by the lid of the switch case.

A cable sealing trough with three alternative bushed entries can be fitted to the bottom of the switch case for the incoming service. Connections are taken from this direct to the fuse and neutral connector, and thence to the meter terminals and from these to the main switch. The consumers' connections are taken from the switch through either of two holes, which are at the right and left sides of the case respectively.

If it is desired to control and meter the heating circuit separately from the lighting a similar unit is fitted to the left or right of the main one, and the fuses and neutral terminal blocks are interconnected through a short piece of conduit which passes through clearance holes at the sides of the switch cases. The bottom of this auxiliary unit is closed by an end plate. A further unit for the separate control and metering of a power circuit can be fitted in a similar manner on the



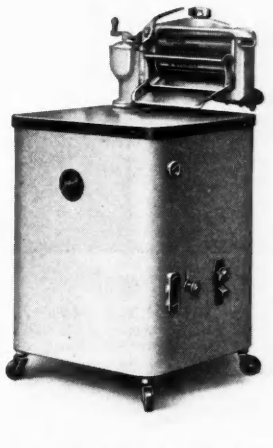
G.E.C. "Sheffield" switch-fuse unit

other side of the main unit when required.

Improved Washing Machine

A number of improvements have been incorporated in the 1940 model "Dragor Supereasy" electric washing machine supplied by DRAKE & GORHAM WHOLESALE, LTD., 77, Long Acre, London, W.C.2. A new patent quick release sets the wringer rollers free and simultaneously cuts off the power from the rollers, thus giving complete safety. A special feed tray makes the wringer almost self-feeding, while the pressure suspension obviates the necessity for releasing the spring pressure and avoids flats on rollers. The rolls are colour marked to show rotation—an important point in such a silent machine.

The "clothes action" agitator of cast and polished aluminium has three semi-rotary arms operating under the clothes, the action being carried out without rubbing or battering and without damage to the fabric. The washing performance is further improved by the "Nolos" circulating heater, which causes upward currents of hot water to pass through all the pan contents. This heater, which is loaded at 3.3 kW and is provided with a three-heat switch, permits boiling of



"Dragor Supereasy" washer

the clothes, if desired. With these improvements there is no need to leave clothes in the machine longer than five minutes, silks and woollens taking less time.

An automatic control operated by the water level in the pan prevents accidental overheating, boiling dry or switching on without water in the pan. The stainless steel pan cannot chip or corrode and the white vitreous enamelled top forms a useful table.

COMMERCIAL and INDUSTRIAL NEWS

Fostering Export Trade. Lighting Fittings Prices. Scottish Contractors' Meeting

Export Trade Expansion

INTRODUCING the Board of Trade Vote in the House of Commons last week, Sir Andrew Duncan said that export trade was not only helping us to conserve and add to our financial resources, it was contributing to lay a foundation for post-war activities. It was the duty of the Board of Trade to see that imports were paid for by exports to the fullest possible extent.

The general policy of the Board was to grant licences freely for the importation of raw materials or goods which were to be finished in this country, and the utmost had been done to enlist the goodwill of the trading community without which it was impossible to achieve the maximum export. There were already 120 Export Groups through which added energy was being imparted to the conduct of export trade.

The Exports Guarantee Department had expanded its facilities to meet the greater risks which arose in wartime. Recent events had resulted in a temporary loss of certain markets, but there were added opportunities in the markets formerly served by the invaded countries, although the adjustment would take time. At the present moment much of our effort must be diverted from export trade to the production of munitions, but activity must be intensified in those directions in which export trade did not interfere with the manufacture of war supplies. It would also be necessary to restrict the supply of materials for the production of goods for home consumption.

Limitation of Dividends

The Chancellor of the Exchequer announced on Tuesday that it had been decided not to proceed with the Limitation of Dividends Bill in view of the fact that the excess profits tax had been raised to 100 per cent. The prohibition of bonus issues for the period of the war would remain.

Lighting Fittings Price Increases

By a decision of the Council of the Electric Light Fittings Association members have authority to apply, on or before Monday, June 10th and until further notice, the following amended total wartime price increases (minimum) on their published prices ruling in September last at the outbreak of hostilities. These minimum increases are justified by the increased cost of production and the wartime increase of 25 per cent. recently imposed by glassware manufacturers in place of their previous 15 per cent. advance: (a) On all illuminating glassware, 25 per cent. (previously 15 per cent.). (b) On the commercial range of fittings, 20 per cent. (previously 15 per cent.). (c) On ornamental and decorative fittings, 20 per cent. (previously 15 per cent.). (d) On the industrial range of fittings, no change on previously authorised increases except spare glassware (25 per cent.). With regard to (b) and (c) the total increase on all spare glassware is 25 per cent. instead of the previous 15 per cent.

Contractors' Prices

Some time ago the Electrical Contractors' Association directed its members to insert in all their tenders a "rise and fall" clause to cover them in the event of increases in labour and material costs. At a recent meeting of the London and Home Counties Section of the Association Mr. J. G. Briggs expressed doubt as to the extent to which the direction was being carried out and stated that he was sure that certain Government Departments would in no circumstances agree to the inclusion of the clause. Mr. H. J. Cash, however, stated that he knew that the clause had been included in certain War Office and Air Ministry contracts, or, if it had not, insertion of a clause had been secured which was acceptable to the Association. It was reported at a meeting of the London Branch that the L.C.C. had refused to accept any form of price variation clause, but that the Council of the E.C.A. had decided that no variation of its instruction could be allowed in respect of L.C.C. tenders.

At a number of E.C.A. branch meetings it has been announced that municipal electricity supply authorities have granted increases on the existing rates for installation work carried out by members of the Association. These range from 10 per cent. to as much as 17½ per cent. (Tunbridge Wells).

Export of Voltmeters and Ammeters

The Board of Trade has made the Export of Goods (Control) (No. 14) Order, 1940, which came into force on June 6th under which licences will in future be required for the export to any destination of voltmeters and ammeters between 2 and 2½in. in diameter. Applications for licences should be made to the Export Licensing Department, Inveresk House, 346, Strand, W.C.2.

G.E.C. Window Displays

Some effective new window displays have recently been arranged by the General Electric Co., Ltd., at its headquarters at Magnet House, Kingsway, London, W.C.2. These draw attention to the use of portable electric fires and convector heaters for unexpected chilly evenings, the latest G.E.C. portable battery radio set, vacuum cleaners, and electrical refrigerators. Each window has a topical setting, and in the accompanying picture we show the refrigerator display which points out that by installing a refrigerator the housewife can play her part in the food economy campaign.

A refrigerator display in one of the G.E.C. windows at Magnet House, Kingsway, W.C.2

Scottish Electrical Contractors

In view of the state of National emergency, it was decided that the usual summer conference of the Electrical Contractors' Association of Scotland could not take place this year. Instead, the Association held its annual general meeting in the Ca'doro Restaurant, Glasgow, on May 29th. It was decided at the last moment to cancel the usual golf match. Despite the present difficult circumstances, there was a good attendance. Mr. H. M. Speirs, Glasgow, the retiring president of the Association, was re-elected as president for a further year, and Mr. H. A. Tait, Edinburgh, the vice-president, was also re-elected. Mr. Walter Finlay, W.S., Edinburgh, was re-appointed as consultant, and Mr. Muir P. Finlay, W.S., as general secretary.

In moving the adoption of the Benevolent Fund accounts, Mr. Ure pointed out that conditions of hardship suffered by members' families as a result of war conditions would receive sympathetic consideration. Matters of interest dealt with during the meeting were mainly concerned with circumstances arising from the war. A general proposal for the organisation of the contracting industry for repair work on the consumer's side of the meter subsequent to air raids was approved, and the proposal is being forwarded to the Regional Commissioner for Scotland. On the conclusion of the business the meeting adjourned for an informal luncheon, and in the afternoon the Central Board met, to consider urgent measures of war legislation.

In the course of his address at the annual meeting Mr. H. M. Speirs maintained that the preparation of tenders at the present time was undesirable in view of the urgency now prevailing. He suggested that the allocation of work to capable firms, paid for on a percentage on costs basis, would ensure a greater volume of work being completed in a much shorter time. The resources of smaller firms might be pooled for the purpose of carrying out work of national importance.

Scottish Electricians' Wages

In terms of an agreement entered into between the Electrical Contractors' Association of Scotland and the Electrical Trades Union to regulate the wages of electricians on a cost-of-living sliding scale, an increase of ¼d. per hour will take place on and from June 1st. The new rate will be 1s. 9d. per hour. The next review of wages will take place in August, and thereafter a further adjustment will take place in November, after which the agreement will be reviewed. The increase in journeymen's wages, besides affecting the electrical contracting industry, will also apply to electricians employed on the maintenance of electrical equipment in all classes of factories and workshops, and a large number of men employed by local authorities. The number of men affected by this agreement is approximately 3,500.

E.I.B.A. Needs Helpers

The Electrical Industries Benevolent Association is asking for a thousand people to champion its cause in their offices by enrolling their colleagues as subscribing members or associate members. The secretary will provide further information, together with suggestions as to the plans which could be adopted in each case. It is hoped that there will be a large response to this and to the other sections of the E.I.B.A. Emergency Appeal, the success of which, it is emphasised, is primarily dependent upon the men and women in the industry forthwith volunteering their help without further asking. With the increasing calls which are being made on the E.I.B.A. for its aid, more helpers are needed to supplement the work of those who have in the past done much more than their share. Offers will be welcomed by the secretary at 6, Southampton Place, London, W.C.1.

Wartime Street Lighting

To allow greater flexibility in the siting of street lighting fittings, BS/ARP/37 has been revised in respect of Clause 4, mounting height and spacing. No change has been made as regards the fittings to be used for spacings of not less than 100ft., but additional information is now given as to how to install fittings in situations where the pole spacings are between 50ft. and 100ft. This revision has been effected by means of a sheet, CF(ARP)5597, copies of which may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, on receipt of a stamped addressed envelope.

F.B.I. and Control of Industry

Following an emergency meeting on May 29th of the Executive Committee of the F.B.I., a statement was issued to the effect that the Federation wholeheartedly accepts the control of industry which the danger facing the country renders necessary. This control will raise many problems, economic, commercial and financial, both during the war and the subsequent period of reconstruction. As a practical step to assist in the efficient functioning of industry in the national interest, the Federation has decided to set up a central committee of controlled undertakings under the chairmanship of the president, Lord Dudley Gordon, in order to serve as a focus of industrial effort and opinion. This committee will be composed of representatives of the industries and firms affected. Local committees will be formed where necessary. A special department has been formed at the Federation to deal with the problems which will arise. This new organisation of the F.B.I. will not deal with labour questions, which are being handled by the British Employers' Confederation.

Trade with Norway

The Trading with the Enemy Branch continues to receive inquiries from the public which suggest that doubts still exist as regards the application of the Trading with the Enemy Act and the Orders made thereunder to Norway. It must be clearly understood that for the purpose of the Act and of any Orders made thereunder, enemy territory means "any area which is under the sovereignty of, or in the occupation of, a Power with whom His Majesty is at war, not being an area in the occupation of His Majesty or of a Power allied with His Majesty." Save exceptionally with the permission of the Trading with the Enemy Branch on behalf of the Treasury and the Board of Trade, no business may be done with persons or concerns in the enemy-occupied part of Norway. Traders and others are advised to consult the Trading with the Enemy Branch at Alexandra House, Kingsway, London, W.C.2, in cases of difficulty.

Standard A.R.P. Signs

The specification for A.R.P. signs (BS/ARP/32) issued in November, 1939, laid down the size of the signs and the standard wording to be used. The degree of illumination was referred to only in general terms. The revision of the specification which has just been published goes a good deal further; there are eleven drawings illustrating various types of fittings for location and direction signs, and reference is made to luminescent signs. The clauses dealing with the brightness and with the control of light have been amplified, and details of the method of testing signs for compliance with these clauses are included in an appendix. A further addition is an appendix on alternative lighting for emergency use, as a provision against the event of mains failure. Copies of the specification can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 6d. each (postage 2d.).

The A.O.E.C.

The annual meeting of the Association of Officers and Staff Members of Electricity (Power & Supply) Companies of Great Britain was held in London on May 17th. Mr. J. J. Lesser, chairman of the Executive Committee, presided in the absence of the president, Capt. J. M. Donaldson, M.C. In presenting the annual report, the chairman emphasised that the Association was not a trade union; its sole function was to secure that in any public or private legislation affecting the organisation of the industry employees who were displaced or whose conditions were worsened should receive compensation. Brig.-Gen. R. F. Legge, C.B.E., D.S.O., was elected president for the ensuing year.

Radio in Cars

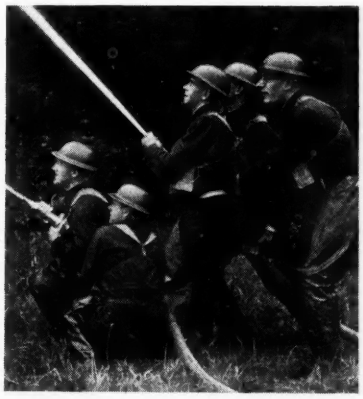
The Postmaster-General has announced that all wireless receiving licences for apparatus installed in motor cars or other road vehicles are cancelled as from May 31st, 1940.

Anglo-American Year-book

The difficulties which must necessarily arise during the present world crisis with regard to Anglo-American trade make the 1940 edition of the "Anglo-American Year Book" just published (American Chamber of Commerce in London, Bush House, Kingsway, W.C.2, 10s. net) a work of reference which is essential to all interested in Anglo-American trade. There are alphabetical lists of members of the American Chamber of Commerce, a residential directory of Americans in this country, a commercial directory of American companies, with the names and addresses of their representatives in this country, and a classified list of trades and professions.

Fire Drill at Milton Court

Although the staff of W. T. Henley's Telegraph Works Co., Ltd., is now housed in pleasantly rural surroundings at Milton Court, Dorking, the A.R.P. organisation is being kept up to a state of high efficiency by frequent practices. Not the least important part of the organisation is the Fire Service which, as our picture shows, is "keeping its hand in."



Henley firemen in action at Milton Court

Aluminium Alloys

Data on aluminium sheet and sections are presented concisely in a booklet issued by the British Aluminium Co., Ltd. Those portions of the information which relate to sheet and extruded sections have been included in the company's reference book, "Aluminium Facts and Figures." Tabular matter concerning alloys wrought to British Standard and Air Ministry D.T.D. Specifications, also contained in the new booklet, is issued simultaneously as a loose inset. Both booklet and loose inset may be obtained by any user of aluminium.

Palestine Customs Tariff Modification

According to the *Board of Trade Journal*, modifications have been made in the Palestine Customs Tariff. All goods formerly dutiable at 12 per cent. *ad valorem* are now dutiable at 15 per cent. *ad valorem*. The following electrical items are affected: Electric cookers; refrigerators; radio sets and parts; electric meters; electrical apparatus not elsewhere specified; and other electrical goods.

Unearthed Machine Casing

At Ashton on May 30th, J. & E. Arnfield, engineers, Audenshaw, were summoned for not taking steps to prevent the casing of machinery from becoming electrically charged. A factory inspector, giving evidence, said that as the result of this omission a lad of fifteen received a fatal shock. The works electrician responsible for the machine admitted that he had not earthed it as he could not find a suitable piece of wire. The defendants, who submitted that the accident occurred through their electrician's negligence, were fined £50 with costs.

E.A.W. Speakers' Course

A successful three-day course organised by the Electrical Association for Women to give members in the Central England area knowledge of public speaking and so train them to address other women's organisations, was held last week in Birmingham at the electricity showrooms, Paradise Street, Mrs. F. Forrest taking the chair. Mr. F. W. Lawton, deputy chief engineer and manager of the Birmingham Electric Supply Department, spoke on "How to Prepare a Lantern Lecture," and Mrs. Edwards, E.A.W. organiser for South East England, gave useful advice on "Typical Talks to Different Women's Organisations." Miss Norvick, assistant secretary to the E.A.W., gave a talk on "The Platform, Deportment, Voice and Manner," this being followed by an inspiring talk on "Preparation of Lectures" by Mrs. Porter. One afternoon was spent in practising public speaking, many members making their maiden speech, and the last day was given over to short talks by the members of the course. These were judged by the audience, the successful candidate, Mrs. Furniss (Sutton Coldfield), winning a handbag presented by Mrs. Forrest.

Trade Announcements

Castelco (Great Britain), Ltd., are now occupying new premises at 1a, Bamborough Gardens, London, W.12.

Bulpitt & Sons, Ltd., are closing their aluminium and electrical departments only for the annual holiday from August 3rd to 10th, inclusive.

British Timken, Ltd., has acquired the controlling interest in Fischer Bearings Co., Ltd., of Wolverhampton. Mr. M. Dewar, chairman of British Timken, has also become chairman of the Fischer Bearings Co.

Price Increases

Bulpitt & Sons, Ltd., announce increases in the prices of their "Swan Brand" electrical products varying from 7½ per cent. to 25 per cent.

Herbert Terry and Sons have increased the prices of their "Anglepoise" lamps by 15 per cent.

Prices of Materials

The following changes in the prices of materials have taken place since May 22nd: C. Clifford & Son, Ltd., report, June 5th: Phosphor bronze wire, 1s. 3⅜d., ⅛d. increase.

Henry Gardner & Co., Ltd., report, June 5th: Mercury, £55, £5 increase. English block tin, £277, £6 10s. increase.

New Catalogues and Lists

Ferranti, Ltd., Hollinwood, Lancs.—List IN.16, describing the new No. 1 model high-voltage indicator for use on systems up to 11 kV.

R. Cadisch & Sons, Red Lion Square, W.C.1.—The company's 112-page general catalogue contains sections dealing with electric clocks, torches and A.R.P. lamps, batteries, &c.

Waite & Son, Ltd., Menin Works, Bond Road, Mitcham.—A well-produced list of modern lighting fittings and shades. Some of the illustrations are in colour.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, W.C.2.—Pamphlet No. 608, describing the 1940 model "Dragor Supereasy" electric washing machine.

Midland Electric Manufacturing Co., Ltd., Reddings Lane, Tyseley, Birmingham.—List No. 252, giving particulars of the new "Memlo" low-voltage transformer unit and the new range of "Memlite" adjustable lamp fittings.

Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.—List 852, dealing with a new disappearing type optical pyrometer for measuring very high temperatures.

Bakelite, Ltd., Brackley Lodge, Brackley, Northants.—A revised booklet on laminated bakelite sheet, rod and tube, giving particulars of properties, types, uses and directions for machining, &c.

Zenith Electric Co., Ltd., Zenith Works, Villiers Road, Willesden Green, N.W.2.—An illustrated brochure on "Ceramite" embedded resistance units.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—A leaflet giving details of a new incinerator for use in large stores, works, offices, &c., where women workers are employed and in ladies' cloakrooms, as well as in hospitals for the disposal of bandages and dressings.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

TUPLEX insulating material.

VIGILUS automobile ignition components.

ELECTRICITY SUPPLY

Ayrshire Rural Electrification Postponed. Further Increase in Tariffs

Ashbourne.—COUNCIL HOUSE SCHEME POSTPONED.—The Urban Council Housing Committee has received a letter from the Ministry of Health stating that in view of restrictions on capital expenditure and the demand on labour and materials, it was considered that the Council's scheme for installing electricity in sixty-two houses should be postponed for the time being.

Ayrshire.—RURAL ELECTRIFICATION HELD UP.—It was intimated by Ayrshire Electricity Board at a meeting of the County Council on May 28th that rural development in the county was postponed owing to the war. Small schemes might be undertaken whenever materials and expenditure were allowed.

Barnstaple.—BULK SUPPLY SCHEME.—The Town Council is proposing to borrow £10,550 in connection with a scheme for a bulk supply from the Bideford & District Supply Co., Ltd.

Berwick. — SUB-STATION. — The Town Council is to build a sub-station in the Dock Road area.

Birkenhead.—SUPPLY TO FACTORY.—The Corporation Electricity Committee is to provide an electricity supply to a new factory at Hooton.

Bradford. — PAYMENT OF COMMISSION STOPPED.—Payment of commission by the Electricity Department in respect of apparatus supplied on hire and hire-purchase is to be stopped in view of the recent case at Leeds Assizes.

HIGHER ELECTRICITY CHARGES.—The following increases in electricity prices will come into operation as from July 1st: Ordinary domestic supplies, 10 per cent.; domestic prepayment meter supplies, 1d. per week for consumers paying up to 1s. 5d. per week and 2d. per week above that amount; power, 10 per cent. on basic prices.

Chapel-en-le-Frith.—OVERHEAD LINES.—The Trent Valley & High Peak Electricity Co., Ltd., proposes to erect overhead lines at Buxton Bridge and Peak Dale.

Cheltenham.—OVERHEAD LINE. — The Corporation Electricity Committee has obtained consent to erect an overhead line to Staverton.

Coventry.—LOAN.—Sanction to borrow £7,245 for equipment is being sought by the Corporation Electricity Committee.

Glasgow. — MAINS EXTENSIONS. — The Electricity Committee has agreed that special extensions of distributing mains shall be carried out at a cost of £7,277.

Heston and Isleworth.—NEW PLANT.—The Town Council is to apply for permission to install at the generating station a turbo-alternator and auxiliary plant estimated to cost £2,772. If the application is granted it is estimated that there would be a saving of £1,300 per annum, due to a reduction of 400 kW in the peak load.

Hornsey. — IMPROVED LOAD FACTOR.—It was stated at the last meeting of the Town Council that since the war the load factor of the electricity undertaking had improved, but the consequent financial advantage was negatived by additional costs which now had to be borne. During the year ended March 31st last the number of kWh imported by the undertaking as bulk supply was 19.8 million, a decrease of 3.4 million (14½ per cent.). The Electricity Supply Committee reported that it was satisfied with the results in the circumstances.

Ilford. — LOW-INTENSITY LIGHTING. — Having considered an estimate of £4,161 for installing subdued street lighting, with maintenance at £3,537 a year, the Works Committee has asked the borough electrical engineer for a revised estimate for bus routes only.

London.—BERMONDSEY.—The following increases in electricity charges are proposed:—Lighting flat rates by 1d. per kWh; heating and cooking from 1d. to 1½d.; power and special tariffs by 20 per cent.; power (large users with coal clause), 15 per cent.

Macclesfield.—SUPPLY TO RAINOW.—A request has been received from the Rainow Parish Council for the electricity mains to be extended to the district, and the Macclesfield electrical engineer (Mr. P. Clegg) is to report on the matter.

Milford Haven.—CHANGE-OVER.—On the advice of the engineer the Electricity Committee has confirmed the policy of further changing over to AC.

Sheffield.—MAINS EXTENSIONS.—Mains extensions are to be carried out by the Corporation Electricity Committee at a cost of £8,237.

SUBSTATIONS.—Sites for five substations have been selected on the Parson Cross housing estate.

Stoke-on-Trent. — DISTRIBUTION PROJECTS.—The Electricity Committee is to augment the supply to the housing estate at Meir at a cost of £150, and a sum of £450 is to be spent on enlarging the transformer capacity at Southlands Avenue substation, Longton. Sanction has been obtained to borrow £8,400 for the supply to the Great Fenton Colliery and re-sanction to £25,000 for mains and services.

Taunton.—HIGH-VOLTAGE CABLE.—At a recent meeting of the Town Council the Electricity Committee reported that for the purpose of the existing supply of electricity in the Bishop's Lydeard and Halse districts it was necessary to replace the present 2,200-V cable by a 11,000-V main before the winter of 1940-41, and the Committee had authorised this work to proceed at an estimated cost of £1,290.

SUPPLY TO PUMPING STATION.—The Council has authorised a supply of electricity to the proposed pumping station at Otterhead, and to the filtration works at Fulwood.

Tynemouth. — SUBSTATION PLANT.—The Town Council is to spend £1,466 on switchgear for the Tanners Bank substation.

Wycombe.—TRANSFER OF UNDERTAKING. On May 23rd the undertaking of the Wycombe (Borough) Electric Light & Power Co., Ltd., was purchased by the Wycombe Corporation. The engineer and manager, Mr. C. T. Westlake, who becomes borough electrical engineer, informs us that the majority of the staff have been engaged by the Corporation.

Overseas

India.—SCHEME FOR WEST GODAVARI.—The Ellore correspondent of the *Madras Mail* states that, according to a Government communication to the West Godavari District Board, a scheme for the electrification of West Godavari District is under consideration. In December last the Board passed a resolution requesting the Government to allow it to distribute electricity produced by Government power stations to Panchayat Boards in the District. In its reply Government has rejected the Board's request and stated that a scheme for the electrification of the District by the Government itself is under consideration.

Italian East Africa.—ELECTRICAL POWER DEVELOPMENTS.—Reviewing the industrial development of Italian East Africa in a pamphlet issued by the Fascist Institute of Italian Africa in connection with the anniversary of the conquest of Abyssinia, Count Volpi di Misurata, president of the Fascist Federation of Industrialists, states that the Compagnia Nazionale Imprese Elettriche, a public utility undertaking (*Ente*), with capital provided by the greater national undertakings of the electrical industry, had already created an initial system for the provision of electrical power. The number of centres provided with power stations had increased from 13 to 22, and the power installed had been increased four-fold.

Italy.—POWER PLANT INAUGURATED.—The new hydro-electric power plant erected by the Societa Terni at Salisano, with a capacity of over half a milliard kWh a year, was inaugurated recently by Signor Mussolini.

Rumania.—ELECTRICAL OUTPUT. — The 48 most important electricity works in the country, representing about 80 per cent. of total private and public consumption, produced 489 million kWh in 1939, compared with 465.9 million kWh in 1938, an increase of nearly 5 per cent.

Slovakia. — HYDRO-ELECTRIC DEVELOPMENT.—The second stage of constructional work on the Illava hydro-electric works will shortly be commenced. This will have an output of about 600,000,000 kWh per annum and will be completed in three or four years.

TRANSPORT

London.—MORE TROLLEY-BUSES.—Trolley-buses will replace trams this month on the Bloomsbury-East Ham and Aldgate-Barking routes. All routes north of the Thames with the exception of the services running through the Kingsway Tunnel to South London will then have been converted to trolley-buses. This completes the first half of the London Passenger Transport Board's scheme. Conversion of the South London section has been postponed until after the war.

Switzerland. — SPECIAL LOCOMOTIVES.—One portion of the Brunig railway between Lucerne and Interlaken has been electrically operated for some time, but because of the severe gradients between Brienz and Lucerne steam-driven rack locomotives have continued to be employed on this section. These, however, have now been replaced by sixteen special locomotives adapted to work on both the ordinary and rack sections of the line.

RADIO AND TELEPHONY

Afghanistan. — NEW RADIO-TELEGRAPH SERVICE.—The *Journal des Télécommunications* reports that a radio-telegraph service has recently been established between Germany and Afghanistan.

India.—TRAVANCORE PHONE LINK.—A link connecting Travancore with the British Indian trunk telephone system has recently been inaugurated.

Palestine.—BAN ON RADIO SETS.—A defence regulation gazetted last Friday prohibits the use of radio sets in cafés, restaurants, shops and other public places or on vehicles except on the authority of the District Commissioners. —*Reuter* (Jerusalem).

United States.—VEHICLE RADIO-TELEPHONE SERVICE.—It is reported from Pittsburgh, Pa., that the Bell Telephone Co., has applied for a permit to install transmitters and receivers in certain commercial vehicles handling calls on a "tie-up" with existing wired telephone facilities. The company has applied to the Federal Communications Commission in Washington for permission to place transmitting and receiving equipment on top of its Pittsburgh building and at certain suburban situations. With this service, any private or commercial telephone subscriber could converse with the occupants of an equipped motor vehicle moving on street or highway within a 15-mile radius. Each truck or motor car equipped for the service would have its own telephone number reached through a special operator, who would handle such calls. It is to be known as the "vehicular radio-telephone service" and the company's present plans include making it available to public utility company trucks and equipment of seven of its own vehicles.

It is pointed out that this equipment in utility and other important trucks would permit quick mobilisation and centralised direction of motor vehicles in the event of major emergencies. There are present limitations on the number of radio channels available. Otherwise, even at high cost, there would undoubtedly be a public demand for such telephone installations in privately owned cars. The limitation of channels will restrict spread of the service, but the Bell Company looks forward to early equipment of many hospital ambulances this way.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

28452. "Amplifier circuits." Vereinigte Glühlampen und Elektrizitäts Akt. Ges. September 30th, 1937. (520882.)

28673. "Supports for electric lighting fittings." General Electric Co., Ltd., and D. W. Durrant, October 3rd, 1938. (520936.)

28681. "Method of coating a glass tube with luminescent material." British Thomson-Houston Co., Ltd., and L. J. Davies. October 3rd, 1938. (520937.)

29083. "Insulated electrical coils." T. Altham, and Transformers and Welders, Ltd. October 7th, 1938. (520996.)

31428. "Glass-to-metal seals." Marconi's Wireless Telegraph Co., Ltd. October 30th, 1937. (520942.)

31952. "Power - supply apparatus." Westinghouse Electric and Manufacturing Co. November 6th, 1937. (520949.)

32032. "Submarine cables." Standard Telephones & Cables, Ltd., T. R. Scott and W. K. Weston. November 4th, 1938. (520999.)

32123. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and E. W. B. Gill. November 5th, 1938. (520972.)

32124. "Electron multipliers." Marconi's Wireless Telegraph Co., Ltd., and E. W. B. Gill. November 5th, 1938. (520973.)

32129. "Prepayment meters." Measurement, Ltd., C. F. Clifford and F. C. Zula-Crosse. November 5th, 1938. (520974.)

32139. "Thermo-convertors for measuring high-frequency electric currents." Fides Ges. für die Verwaltung und Verwerung von Gewerblichen Schutzrechten. November 5th, 1937. (520976.)

32177. "Electric fittings having spring-loaded plunger contacts." Ward & Goldstone, Ltd., and W. H. Willett. November 7th, 1938. (520981.)

32181. "Automatic stopping devices for lifts." F. Barraclough, H. Bean, W. H. Bean and W. Scott (trading as Newton, Bean & Mitchell). November 7th, 1938. (520918.)

32329. "Luminescent powders and methods of manufacturing the same." British Thomson-Houston Co., Ltd., J. T. Anderson and R. S. Wells. November 6th, 1938. (521099.)

32253. "Electrically operated cooking apparatus." J. W. Myers and S. J. Roesch. November 7th, 1938. (520983.)

32384. "Electric-discharge lamps." British Thomson-Houston Co., Ltd. November 9th, 1937. (521110.)

32385. "Electric heating - plates." General Electric Co., Ltd., and G. A. Cattell. November 8th, 1938. (521111.)

32390. "Selector switch banks." Standard Telephones & Cables, Ltd. (F. van Laethen). November 8th, 1938. (521004.)

32391. "Teleprinter exchange systems." Standard Telephones & Cables, Ltd., and G. A. M. Hyde. November 8th, 1938. (521005.)

32392. "Switching arrangements for systems employing ultra-high-frequencies." Standard Telephones & Cables, Ltd., and L. J. Heaton-Armstrong. November 8th, 1938. (521006.)

32436. "Alternating-current switching arrangements." Patentverwertungs Ges. Hermes. November 8th, 1937 (Cognate applications 32437/38/39/40/38.) (521125.)

32452. "Speed control of alternating-current generators." D. R. Price, and Metropolitan-Vickers Electrical Co., Ltd. November 8th, 1938. (521126.)

32453. "Electrically controlled generators." L. Allieri. November 8th, 1937. (521127.)

32473. "Hearths for electric fires and heaters." E. F. Jobling. November 9th, 1938. (521011.)

32499. "Hinged shields for electric switches and like control." Graviner Manufacturing Co., Ltd., and A. Mathisen. November 9th, 1938 (521132.)

32585. "Coils for electrical purposes." G. H. Fletcher, and Metropolitan-Vickers Electrical Co., Ltd. November 9th, 1938. (521019.)

32764. "Television and like systems." W. Jones and Pye, Ltd. November 10th, 1938. (521028.)

32792. "Electric lampholder adapters." Ward & Goldstone, Ltd., and W. H. Willett. November 11th, 1938. (521044.)

32816. "Accumulator batteries particularly for motor vehicles." M. Folpini. May 4th, 1938. (521045.)

32863. "Lining for eddy-current furnaces and method of producing same." Allmanna Svenska Elektriska Aktiebolaget. November 18th, 1937. (521048.)

32865. "Electron - discharge structures." Standard Telephones & Cables, Ltd. December 1st, 1937. (521049.)

32866. "Electric-discharge tubes and devices relating thereto." Standard Telephones & Cables, Ltd. December 31st, 1937. (521050.)

32913. "Electro-magnetic vibratory relays." General Electric Co., Ltd., and J. E. Collyer. November 12th, 1938. (521052.)

33483. "Turbo-generators." Aktiebolaget Ljungstroms Angturbin. November 18th, 1937. (521069.)

33506. "Electrical protective and distribution systems." Whipp & Bourne, Ltd., and F. Whipp. November 18th, 1938. (Cognate application 5979/39.) (521073.)

33507. "Protective arrangements for electrical distribution systems." Whipp & Bourne, Ltd., and F. Whipp. November 18th, 1938. (521074.)

33529. "Electron-discharge devices." Electrical Research Products, Inc. November 26th, 1937. (Cognate application 33530-1/38.) (521,077.)

33564. "Electric time switches." Fabrik Elektro Apparate F. Sauter Akt. Ges. November 18th, 1937. (521079.)

35945. "Electric storage batteries." Ceag, Ltd., and R. J. Plummer. December 9th, 1938. (521084.)

1939

20209. "Electric signalling systems." Standard Telephones & Cables, Ltd. (E. M. Deloraine and A. H. Reeves). November 1st, 1938. (Divided out of 509820.) (521139.)

21147. "Resistance unit for spot and flood lamps." P. Mole and E. C. Richardson. July 20th, 1939. (520925.)

Financial Section (*Concluded from page 624*)

Reports and Dividends—contd.

showed a satisfactory position, especially when they took into consideration that two departments of the main factory in full production had been transferred to their new factory outside London. Most of the development and research work carried on over the past few years had proved to be of great value in the present time, and when the war was over all of it would prove to be a great asset to the company and enable them to consolidate the position still further. The arrangements mentioned at the last meeting for the distribution of their more technical products throughout the world still stood, but they would not be able to secure any benefit from them until the war was over. All their departments were working to capacity on important work. They had five factories working under the general direction from West Dulwich. They had had to face very considerable A.R.P. expenditure during the year under review, the whole of which had been written off, but a further amount would be incurred during the current year. They had organised a National Savings Group among their staff and employees.

The Ever-Ready Co. (Great Britain), Ltd.—Presiding at the annual meeting, held on June 3rd, Mr. Magnus Goodfellow (chairman and managing director) said that at the outbreak of war the black-out caused so great a public demand for their goods that in spite of the preparations they had made it was not until February that they were able to meet the demand. To-day they were in sufficient supply and they expected to be able to maintain this position during the present year. The cost of production of their goods had risen steadily since September last. Apart from a few unimportant increases in their prices, such increases in cost had greater volume of business done. It was their policy to keep the prices of their goods at the lowest possible level, and they did not at present contemplate any alterations. Indeed, they hoped that the much larger business would make unnecessary any increase for some time to come.

The Chloride Electrical Storage Co., Ltd., has announced a final dividend on the "A" and "B" stock of 5 per cent., plus a bonus of 5 per cent., making 15 per cent. for the year to March 31st (same).

J. Stone & Co., Ltd., report a trading profit for 1939, after providing for reserve for taxation, of £320,303, as compared with £307,990 for 1938. The net profit is £204,012 (against £208,678) and it is proposed to pay an ordinary dividend of 25 per cent. (against 27½ per cent.). The balance carried forward is £231,986 (against £217,073 brought in).

The Metropolitan Electric Cable & Construction Co., Ltd., reports a net profit for 1939 of £34,326, as compared with £29,558 for 1938. Tax reserve receives £16,700, general reserve £2,000 and preference reserve £8,000. As we announced in our last issue, the dividend for the year is 7½ per cent.

The Altrincham Electric Supply Ltd., has declared a final ordinary dividend of 2½ per cent., making 12½ per cent. for the year (unchanged). The final dividend on the deferred shares is 4 22/57ths per cent., making 23 9/57ths per cent. for the year (unchanged). The net profit for 1939 is £34,005 (against £35,579).

Telephone Properties, Ltd., reports a total income for 1939 of £102,771, an increase of £10,278 over the preceding year. The net profit is £37,169, a decrease of £15,939, to which is added £35,172 brought in, making a total of £72,341. Reserve for contingencies receives £5,000, and the dividend on the ordinary stock for the year is 6 per cent. less tax (same). The balance carried forward is £36,928.

Ruston & Hornsby, Ltd., report a trading profit for the year ended March 31st of £345,517, an increase of £26,822. There is set aside for Excess Profits Tax £70,000, debenture interest requires £15,750, and the net balance is £258,583 (against £301,400). From this a sum of £30,000 is placed to reserve for contingencies, and general reserve receives £25,000. The ordinary dividend is maintained at 12½ per cent., less tax, and the balance carried forward is £75,015 (against £55,956 brought in).

Electrical Switchgear & Associated Manufacturers, Ltd.—It is announced by Metal Industries, Ltd., that acceptances of its offer have been received from holders of over 85 per cent. of the issued ordinary shares of Electrical Switchgear & Associated Manufacturers. The offer was conditional on acceptance by 80 per cent. Particulars of the offer were reported in our issue of May 10th.

The Great Northern Telegraph Co., (of Denmark), which has paid 20 per cent. for many years, has paid 5 per cent. on account in respect of the period July 1st, 1939, to January 1st, 1940. The usual interim payment of 2½ per cent., which would normally have been made on July 1st this year, has been cancelled.

Hick Hargreaves & Co., Ltd., have announced a final dividend of 3 per cent., making 5 per cent. for the year, plus a bonus of 5 per cent. (unchanged).

Crompton Parkinson, Ltd., have declared an interim dividend on the ordinary and "A" ordinary of 7½ per cent. (unchanged).

FINANCIAL SECTION

New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares.

New Companies Registered

Shelley Electricals, Ltd.—Private company. Registered May 31st. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical and gas fittings, equipment and appliances, domestic and office appliances, &c. The subscribers are: B. Holden, 37a, Victoria Road, Ruislip Manor, and M. Hammond, 67, Harlyn Drive, Pinner. Registered office: 11, Queen Victoria Street, E.C.4.

Lamp Presscaps, Ltd.—Private company. Registered June 1st. Capital, £15,000. Objects: To carry on the business of electricians, electrical, mechanical, &c., engineers, manufacturers of and dealers in electrical equipment and accessories of all kinds, &c. The directors are: B. R. Agazarian, 19, St. James's Square, S.W.1, and W. B. Cullen, Valley Lodge, Valley Road, Edwalton, Nottingham. Solicitors: E. P. Rugg & Co., 12, Henrietta Street, W.C.2.

Keller Electrical Industries, Ltd.—Private company. Registered May 27th. Capital, £1,000. Object: To carry on the business of manufacturers, importers and exporters of and wholesale and retail dealers in electrical, household and commercial goods; metal workers, electroplaters, smiths, &c. Directors: F. Hearne and S. I. Hawes, both of Birch Grove, Earl Howe Road, Holmer Green, Bucks, and J. Keller, 2, Ashbourne Road, W.5. Registered office: Birch Grove Works, Earl Howe Road, Holmer Green, Bucks.

Companies' Returns

Statements of Capital

Pullars Electric Co. (Brighton), Ltd.—Capital, £5,000 in £1 shares. Return dated February 21st, 1940. All shares taken up. £4,300 paid. £700 considered as paid. Mortgages and charges nil.

Petersfield Electric Light & Power Co., Ltd.—Capital, £40,000 in 30,000 ordinary and 10,000 6 per cent. preference shares of £1. Return dated March 21st, 1940. All shares taken up. £40,000 paid. Mortgages and charges, nil.

Direct Spanish Telegraph Co., Ltd.—Capital, £95,000 in £5 shares (13,000 ordinary and 6,000 preference). Return dated March 13th, 1940. 12,931 ordinary and 6,000 preference shares taken up. £91,655 paid. Mortgages and charges, nil.

Mortgages and Charges

North-Eastern Electric Supply Co., Ltd.—Satisfaction (a) to the extent of £25,750 on May 22nd, 1940, of £1,500,000 3¼ consolidated debenture stock secured by trust deed dated August 1st, 1935, and registered August 13th, 1935; and (b) to the extent of £58,919 on May 22nd, 1939, of £2,500,000 3½ per cent. consolidated debenture stock secured by trust deed dated December 20th, 1933, and registered January 17th, 1934.

J. & N. Wade (London), Ltd.—Satisfaction in full on May 2nd, 1940, of first debenture, dated February 19th, 1940, and registered February 23rd, 1940, securing £1,000.

Rediffusion, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated May 7th, 1940, to secure all moneys due or to become due from the company to C. Hoare & Co.

Gatenby's, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated May 7th, 1940, to secure £200. Holder: Gladys A. Gatenby, 63, Victoria Road, Ruislip, Middlesex.

Receivers Appointed and Released

Neon (Signs & Metalcraft), Ltd.—C. J. H. Jones, 15, Commercial Road, Portsmouth, was appointed receiver on May 25th, 1940, under powers contained in debenture dated September 15th, 1939.

Neon (Portsmouth), Ltd.—A. J. S. Pratt, 102, Victoria Road North, Portsmouth, ceased to act as receiver on May 21st, 1940.

Company Liquidations

Lord & Shand, Ltd., electrical engineers, 31, Westwell Street, Plymouth.—The statutory meeting of creditors was held recently at the Law Chambers, Plymouth, when Mr. H. W. Shannon, a director of the company, occupied the chair. It was reported that a statement of affairs had been previously circulated to the creditors. That statement disclosed liabilities of £1,615 and assets of £1,135. In addition to the liabilities mentioned Mr. Shannon was a creditor for £6,224 in respect of cash advanced, but he was prepared to withdraw his claim. A resolution was passed confirming the voluntary liquidation of the company with Mr. F. E. Bendall, of Poppleton & Appleby, Birmingham, as liquidator. A committee was also appointed.

Sutton (Wirral) Engineering Co., Ltd., Little Sutton, Wirral, Cheshire, wireless and electrical engineers, &c.—The statutory meeting of creditors was held on May 30th at Liverpool, when a resolution was passed appointing Mr. W. Lodge, C.A., as liquidator. A committee was also appointed. A statement of affairs was submitted showing ranking liabilities of £1,184 and net assets were £415, leaving a deficiency, so far as the creditors were concerned, of £769.

J. & E. Sharp, Ltd., electrical engineers, 405, Bury New Road, Prestwich.—The statutory meeting of creditors was held on May 27th at Manchester, when Mr. J. Sharp, one of the directors, presided. According to a statement of the company's affairs the liabilities were £420, while after allowing £45 for preferential claims there were net assets of £75, leaving a deficiency, as regarded the creditors, of £345. The issued capital was £100, and so far as the shareholders were concerned there was a deficiency of £446, which was attributed to the writing down of the assets and the loss incurred on trading. The creditors decided to confirm the voluntary liquidation of the company, with Mr. P. Nelson, C.A., Manchester, as liquidator, with a committee of inspection.

Bankruptcy Proceedings

O. P. Lowther, electrical engineer, Beaufort Mansions, Beaufort Street, London, S.W.—The adjourned first meeting of creditors was held on May 29th at London Bankruptcy Buildings. The statement of affairs showed liabilities of £4,029 against assets valued at £1,000. A resolution was passed appointing Mr. F. S. Salaman, C.A., Bucklersbury, E.C., as trustee of the estate.

S. V. Knight, electrical engineer, 10a, Watford Way, Hendon, N.W.—The public examination was held on May 23rd at the London Bankruptcy Court before Mr. Registrar Kean. The statement of affairs filed showed liabilities of £5,196, and assets estimated to realise £728. Debtor attributed his failure to lack of capital, bad debts, poor health, pilfering by an employee, decline in trade, and increased cost of materials. The examination was concluded.

A. E. Webster (trading as Electric Supplies Co.), 37, Walbrook, E.C.—The public examination of this debtor was held on May 28th at the London Bankruptcy Court. The statement of affairs filed showed liabilities of £1,120, and assets estimated at £608. Replying to the Official Receiver, debtor stated that he started business in Walbrook in October, 1935, with a capital of £380. He traded without any great difficulty until early in 1939, when he had to borrow money to meet overdue accounts. After the outbreak of war many of his customers departed from London and reduced their requirements, certain manufacturers stopped his credit, and finally increased pressure by creditors caused him to file his petition. The examination was concluded.

H. H. Moore, Junior, "The Lindens," West Cliff Gardens, Bournemouth, electrical engineer.—The application for discharge was heard recently at the Law Courts, Stafford Road, Bournemouth. The receiving order had been made in 1937. It was stated that debtor had done maintenance work for various hotels, and the Official Receiver suggested that his failure was due to his inexperience. The discharge was granted.

T. Riley, electrical dealer, Mossley Nursery, Mossley, Congleton.—Receiving order made May 27th on a creditor's petition.

M. Franks, electrical and radio engineer, 4, Bayford Road, Littlehampton, lately trading at Arcade Road, Littlehampton.—Last day for receiving proofs for dividend June 19th. Trustee, Mr. C. Latham, 185-188, High Holborn, London, W.C.1.

Reports and Dividends

Siemens Bros. & Co., Ltd., held their annual meeting on June 4th, when Lord Queenborough (chairman), who presided, said that since the beginning of September their cable manufacturing capacity had been mainly devoted to the production of cables for military and naval purposes. Submarine Cables, Ltd., owned jointly by themselves and the Telegraph Construction and Maintenance Co., Ltd., was fully occupied during the year. While their shops concerned with underground power cables were working nearly to full capacity during most of the past year, war conditions brought about a marked decline in orders for these cables in the closing months. The output of underground telephone cables remained at a high level, and 400 miles of trunk cable were installed for the British Post Office. Two important sections of 12-channel carrier trunk circuits were completed. The telephone shops were working at full pressure and many emergency equipments were made and installed. From overseas, contracts were received for new exchanges and extensions of existing ones. The private telephone business, both sales and rental, was well maintained at home and abroad and special apparatus used in A.R.P. measures was supplied to many offices and factories. Business in ships' telegraphs and telephones and wireless equipment, including radio telephones and direction finders, showed a substantial increase. They were fully alive to the importance of maintaining connections with their overseas customers and they were also in close touch with the export groups concerned. Their subsidiary company, Siemens Electric Lamps & Supplies, Ltd., had had another successful year. Heavy demands by the Services brought about a substantial increase in the sales of rubber insulated wires and dry batteries. With regard to the current year, orders for the first five months showed a substantial increase compared with those of the same period of last year.

The British Thermostat Co., Ltd.—Presiding at the annual meeting on June 4th, Col. N. Hudson (chairman), said that the balance sheet and accounts indicated an advance in prosperity exceeding considerably that predicted at the last annual meeting. This was not solely attributable to armament production, but a steady increase in demands for their commercial products in industry generally. Since the war began every opportunity had been taken to extend and consolidate the business which had been facilitated by the absence or restriction of foreign imports. No effort had been spared to develop sound programmes and plans for immediate operation when peace came. These included the development of a wide range of heat-controlled instruments for industrial and domestic use and the design, purchase or manufacture of the necessary tools, machinery and equipment for their production.

The Telephone Manufacturing Co., Ltd., held its annual meeting on June 3rd, when Mr. F. T. Jackson (chairman and managing director) who presided, said that the accounts under review

(Continued on preceding page)

STOCKS AND SHARES

TUESDAY EVENING.

THE eyes of the Stock Exchange wait upon developments from Italy. On the eve of what may be momentous decisions, it is only to be expected that business should have approached still nearer to a full stop. An outstanding feature is the firmness of British Government securities. The ordinary shares in industrial companies have fallen out of favour, not only because of the limitation of dividends and the 100 per cent. E.P.T., but also through the reluctance which a good many people nowadays feel to invest money in anything except British war loans. News of the abandonment of the Dividend Limitation Bill by the Government came too late on this, Tuesday, evening, to affect Stock Exchange prices. There should be, however, a fairly material recovery as a result.

Reference has often been made in these paragraphs to the variations of fashions in finance, and a striking example is afforded by the decline in popularity of what are called equity shares, accompanied by a return of public favour to British Government securities. Business in the Stock Exchange markets is quieter than it has been for several years past.

E.P.T. 100 Per Cent.

After the original decision that the raising of the Excess Profits Tax from 60 to 100 per cent. should apply only to firms coming under Government control, the Treasury was quick to abandon that qualification, as being likely to cause undue complication and inequality. In turning the screw full circle so as to cover every manner of enterprise, the Chancellor's action is accepted as a measure in keeping with the needs and spirit of the time. It is remembered, in any case, that for many companies, profits can reach a decidedly respectable level before they come into the excess class; the "standard" years to be taken as the basis for the calculation were periods of some prosperity, and there remains an opening for special claims by concerns which feel themselves unfairly used. The dividend limitation proposal was automatically rendered redundant by the elimination of all profit increases under wartime conditions, but the Chancellor left no sort of doubt, in his speech last week, that industry and individuals must begin to steel themselves against yet more burdensome taxation.

Strength of Gilt-edged

Each fresh uncertainty which adds to the risks in speculative fields of investment, gives one more reason for capital to seek the security of 3 per cent. interest, or thereabouts, in the gilt-edged market. Double that rate of income-return from the most trusted industrials is often insufficient to tempt money into channels open to special taxation, subject, moreover, to an Emergency Powers Act which puts every business and factory, its workmen, wages, products and prices, at the disposal of the Government. The gilt-edged market draws strength, in what might be called a negative manner, from these processes which make other investment outlets less attractive. In a more positive way, the market feels the benefit of rising confidence in the ability of the Treasury successfully to maintain its cheap money policy, and in its expressed determination that 3 per cent. shall be, roughly speaking, the most liberal rate of interest to be paid on money borrowed for the prosecution of the war. Such considerations have assisted the gilt-edged market to present the witness of confidence in British policy and finances that is implied in the quotation of the 3 per cent. War Loan standing at par.

Electricity Supply

Edmundsons Electricity Corporation group has in good measure the virtue which lies in a well-spread and diversified business. As compared with the previous period, sales rose by 19 per cent. during 1939, and by 24 per cent. in the first four months of this year. On the other side of the medal are the all-round increases in costs referred to by the chairman at last week's meeting. There has been no difficulty, on balance, in keeping the dividend at 6 per cent., which gives the shares, at 21s., a yield of nearly 5¾ per cent. Thoughts about possible bombing damage have continued this week to be an influence in the market for electricity supply shares. The resultant setback of prices here and there has been impartial so far as the matter of locality is concerned, with no special differentiation between London and provincial concerns, or of holding companies. Nearly a score of quotations have been lowered, the falls ranging from sixpence to half a crown.

Equipment and Manufacturing

Leading electrical equipment shares have been giving the good account of themselves which is expected from one of the best respected sections of the industrial markets. Inevitably, prices have not escaped depreciation, but the underlying steadiness has made itself constantly apparent. Callender's Cable Company is emulating Henley's, British Insulated and Enfields in maintaining the dividend (15 per cent. in this case) at the previous rate, and in upholding the cable group's reputation. Siemens report made a good showing, the 7½ per cent. dividend again being well covered, but the shares are depressed at 17s. 6d. Johnson & Phillips have also been under fire; the price at 40s. is down to the lowest and 10s. below the highest of the year. In view of the dropping of the Dividend Limitation Bill, the dividend will presumably be allowed to stand at 15 per cent., which is 2½ per cent. more than the limitation standard. Telegraph Constructions have lost ground to 35s., and Telephone Manufacturing to 7s. despite the substantial progress disclosed in the reports. Other dull spots are English Electrics, at 26s. 3d., and Walsall Conduits, at 23s. 9d. In most of these cases, E.P.T. at 100 per cent. is expected to make its presence felt appreciably.

Communications

Cable and Wireless stocks remain dejected, having derived no comfort from the recent reviews of affairs at the recent meetings of the constituent companies. Although perforce non-committal regarding immediate prospects, the chairmen's statements were not considered to be of a tone to cause particular anxiety. A drop in the price of the Cable and Wireless ordinary of 5½ points this week to 44½—almost the lowest of the year—is suggestive more of necessitous selling, in an unsupported market, than of anything else. A fall of 5 points to 87½ in the price of the preference stock seems equally hard to account for on any other grounds, particularly in view of the strong lead given by the gilt-edged market to debenture and preference stocks as a class. The yield of 6¼ per cent. on Cable and Wireless preference is half as much again the returns to be obtained from the most favoured industrial preference shares. Telephone Properties shares turned dull on the publication of the accounts which show the 6 per cent. dividend, although maintained at last year's rate, to be covered with an appreciably smaller margin of earnings. Telephone Rentals, at 7s. 6d., are also on the dull side. There was no surprise at the decision of Great Northern Telegraph to cancel the interim dividend which would nominally have been due in a few weeks' time. The price of the £10 shares is steady at £13, the quotation at which they have settled down since the occupation of Denmark, and which is calculated to be fairly well represented by assets outside the actual business.

Miscellaneous Markets

Conditions in the Home Railway market have gone from bad to worse. The rot in this section has reached the pitch where some stocks have shed thirty points or so in only about double that number of days. Speculative Southern Railway stocks have been particularly affected because the areas served are supposed to be the most exposed to damage by the enemy. The nearer possibility of such damage—the cost of which falls upon the companies if in excess of £10 millions in a year began the rout: the liability to E.P.T. and the collapse of weak speculative positions did the rest. The last is considered to have given a greatly exaggerated idea of the apprehension which is actually entertained. Southern 5 per cent. preferred stock has shed another 8 points this week. The present price of 42½ compares with the recent best of nearly 80. The yield is in double figures. The company's 5 per cent. preference is down 6, at 82½. London Transport "C" stock has lost a further 2 points, at 35½. Central Electricity Board stocks are a dull market. Electric & Musical Industries shares are a weak feature in the miscellaneous market; after touching 10s. a few weeks ago, the price is now no better than 6s. Vickers shares have dropped by 2s. to 12s. 3d.

Industrial Markets

Prices in the industrial markets have followed the changing fortunes of the B.E.F. From the day of the Belgian letdown until the first news of the brilliant withdrawal from Dunkirk, quotations were forced back. There was virtually no support against the action of relatively few sellers prepared to take rubbish prices for good stock. At the gravest moments, many quotations became nominal; dealing even in the popular issues was apt to be a matter of negotiation. In other words, the market could not accommodate a seller unless a corresponding buyer were in sight. The near presence of the enemy set minds running on air-raid risks, and shareholders began showing unwonted interest in such matters as locality and diversification, or concentration, of factories and businesses. Sir Kingsley Wood's announcement of maximum E.P.T. and sterner financial things to come assailed markets on another front. Although harassed on two sides, markets showed, notwithstanding, no sign of confusion or panic.

Highest and Lowest

Mention was made last week of the manner in which Stock Exchange official quotations are provided, and their publication repeated in our price-lists week by week. In these days of crisis, a further complication is introduced by the difficulty of the negotiation of business in Stock Exchange securities which results in the acceptance by a pressing seller of prices that are difficult to justify on the quotations officially supplied by the Stock Exchange Committee. For instance, Cable and Wireless ordinary stock is quoted officially at 42 to 47; that is, at 44½ middle—the lowest price of the year—but stock changed hands on Tuesday in this week at 40. The bargain may have related to some small amount of stock for which the holder was content to accept a very low figure; but when it comes to giving the lowest price of the year, the problem presents itself as to what actually is a fair figure to include in our list. Another illustration can be seen in the price of London Passenger Transport "C." Against the official price of 35½ several dealings are marked down to 32. Readers who have dealt, either as buyers or sellers, at prices outside the range of those quoted in our price-lists, will appreciate the difficulty.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 High-est	1940 Low-est	Dividend Pre-vious	Dividend Last	Middle Price June 4	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	63/6	55/–	15	15	55/–	–2/6	5 9 0
British Power and Light	30/–	24/–	7	7	24/6	–6d.	5 14 3
City of London	28/–	23/–	7½	7½	23/–	...	6 7 8
Clyde Valley	38/6	32/–	8	8	32/6	–½	4 12 4
County of London	43/3	29/6	10½	10½	30/–	–2/–	7 0 0
Edmundson's:							
7% Pref.	31/6	28/–	7	7	31/3	...	4 9 7
Ord.	27/6	20/–	9	6	21/–	–2/–	5 14 3
Elec. Dis. Yorkshire	40/3	35/–	9	9	35/–	–½	5 2 10
Elec. Fin. and Securities	41/3	38/6	12½	12½	38/9xd.	...	6 9 0
Elec. Supply Corporation	46/3	41/–	12	11½	42/6	...	5 8 3
Isle of Thanet	16/–	11/6	4	4	12/–	–1/–	6 13 4
Lancs Light and Power	33/–	27/6	7½	7½	27/6	–½	5 9 0
Llanelly Elec.	21/–	19/6	5½	5½	20/6	...	5 7 4
Lond. Assoc. Electric	21/–	16/–	7	5½	16/3	...	6 15 4
London Electric	37/6	25/–	8	7½	25/–	...	5 16 0
London Power Deb. Red.	105½	103	5	5	104½	...	4 15 6
Metropolitan	41/6	29/6	12	10	30/–	–2/–	6 13 4
Midland Counties	39/–	31/–	8	8	31/3	–½	5 2 5
Mid. Elec. Power	40/–	36/–	8	9	36/3	–½	4 19 4
Newcastle Elec.	29/9	26/–	7	7	26/3	...	5 6 8
North Eastern Electric:							
Ordinary	31/6	24/–	7	7	24/6	–1/6	5 14 3
7% Pref.	32/6	29/6	7	7	29/6	–6d.	4 15 0
Northampton	48/–	41/–	10	10	42/6	...	4 14 1
Notting Hill 6% Pref. (£10)	10⅜	10	6	6	10⅜	...	—
Northmet Power:							
Ordinary	42/3	30/6	10	10	30/9	–½	6 10 0
6% Pref.	29/–	26/9	6	6	27/6	...	4 7 3
Richmond Elec.	24/6	22/9	7	6	23/9	...	5 1 1
Scottish Power	38/–	30/–	8	8	30/–	–2/–	5 6 8
Southern Areas	21/3	17/–	5	5	17/–	–1/–	5 17 8
South London	23/3	22/–	7	7	22/–	...	6 7 3
West Devon	20/–	18/6	5	5	20/–	...	5 0 0
West Glos.	21/3	16/6	2	2½	20/–	–½	2 10 0
Yorkshire Elec.	40/–	32/3	8	8	32/–	–6d.	5 0 0
Overseas Electricity Companies							
Atlas Elec.	4/–	2/–	Nil	Nil	2/–	...	—
Calcutta Elec.	37/–	29/6	10*	8*	29/6	...	5 8 6
Cawnpore Elec.	30/–	28/6	10	10	28/9	...	6 19 2
East African Power	25/6	23/3	7	7	25/–	...	5 12 0
Jerusalem Elec.	24/–	21/6	7	7	23/–	...	6 1 9
Kalgoorlie (10/–)	12/6	9/6	7½	7	12/–	...	5 16 8
Madras	26/9	26/–	8*	8*	26/3	...	—
Montreal Power	35½	30	1½	1½	31½	–1	—
Palestine Elec. "A"	25/–	21/–	7½*	5*	21/3	...	4 14 1
Perak Hydro-electric	20/3	14/6	6	2½	14/6	–6d.	3 9 0
Shawinigan Power	27½	20	83cts.	90cts.	20	–1	—
Tokyo Elec. 6%	69	57	6	6	57½	...	10 8 8
Victoria Falls Power	75/9	66/–	12½	15	66/3	–½	4 10 9
Whitehall Investments Pref.	17/9	11/6	7½	7½	12/–	–1/–	12 10 0
Public Boards							
Central Electricity:							
1950–70	110½	106	5	5	106½	–1	4 14 0
1955–75	112½	106	5	5	106	–2½	4 14 0
1951–73	107½	102	4½	4½	102½xd.	...	4 7 10
1963–93	96½	90	3½	3½	92½	...	3 15 8
London Elec. Trans Gtd.	92	87½	2½	2½	91	...	2 15 0
London & Home Counties							
1955–75	113½	105	4½	4½	105½	...	4 5 4
Lond. Passenger Transport							
A	116	104	4½	4½	105xd.	–1	4 5 9
B	116	103	5	5	104½xd.	+1½	4 15 8
C	65½	33	1½	—	35½	–2	—
West Midland Joint Elec., 1948–68	106½	105	5	5	106½	...	4 14 0
Telegraph and Telephone							
American Tel. & Tel.	215	180	9	9	180	...	5 0 0
Anglo-Am. Tel.:							
Pref.	106	93½	6	6	98½	–2	6 1 10
Def.	23⅜	21	1½	1½	21½	–½	6 19 6
Anglo-Portuguese	22/6	19/9	8	8	20/–	...	8 0 0
Cable & Wireless:							
5½% Pref.	99¾	87	4½	5½	87½	–5	6 5 9
Ord.	65	42	4	4	44½	–5½	9 0 0
Income	99¾	93	—	—	98½xd.	...	4 1 5
Canadian Marconi $1	6/–	4/6	Nil	4cts.	5/–	...	—
Globe Tel. & Tel.:							
Ord.	32/6	28/6	7½*	7½*	32/6	...	4 12 4
Pref.	28/9	24/6	6	6	26/3	...	4 11 3
Great Northern Tel. (£10)	20	11	20	20	13	...	15 7 8
Inter. Tel. & Tel.	5½	3	Nil	Nil	3	...	—
Marconi-Marine	30/–	21/–	10	7½	21/3	–½	7 1 2
Oriental Telephone Ord.	2⅞	53/6	12*	11½*	2¾	...	4 3 8
Telephone Props.	15/–	12/6	5	6	12/6	–⅛	9 12 0
Telephone Rentals (5/–)	9/6	7/–	10	10	7/6	...	6 13 4
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	4/3	3/0	Nil	Nil	3/–	...	—
4% Inc.	11½	4	Nil	Nil	5½	–1	—
British Electric Traction:							
Def. Ord.	830	450	5	5	500	+50	—
Pref. Ord.	169	147	8	8	165	...	4 17 0
Bristol Trams	48/6	40/–	10	8*	40/–	–½	4 0 0
Brazil Traction	12½	6	$1	50c.	6½	–1½	—
Calcutta Trams	24/–	20/–	8	8	20/–xd.	–6d.	8 0 0
Cape Elec. Trams	18/6	16/–	5	5	18/6	...	5 8 1
Lancs Transport	35/–	28/3	10	10	35/–	...	5 14 8
Mexican Light:							
1st Bonds	33	28	5	5	30½	...	—
Rio 5% Bonds	90	74	5	5	80	...	6 5 0
Southern Rly.:							
5% Prefd.	79	42	5	5	42½	–8	11 15 2
5% Pref.	104½	80	5	5	82½	–6	6 1 2
T. Tilling	45/9	33/6	10	10	33/9	–3/9	5 18 6
Tilling & B.A.	47/6	43/9	9*	8*	47/6	...	3 7 10
West Riding	35/–	28/6	10	10	32/–	–1/–	6 5 0
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	15/–	15	15	17/6	...	—
Assoc. Elec.:							
Ord.	43/3	37/–	10	10	37/6	–6d.	5 8 1
Pref.	35/3	32/3	8	8	35/–	...	4 11 5
Automatic Telephone & El.	47/3	42/–	12½	12½	43/9	...	5 14 1
Babcock & Wilcox	50/–	37/6	10	11	37/6	–⅛	5 17 5
British Aluminium Ord.	56/–	43/6	12½	12½	43/9	–9d.	5 14 3
British Insulated Ord.	92/6	78/–	20	20	78/9	–⅜	5 1 6
British Thermostat (5/–)	14/9	11/9	18½	18½	12/6	...	7 8 0
British Vacuum Cleaner (5/-)	12/6	8/6	40	12½	10/–	...	6 5 0
Brush Ord.	4/6	3/–	Nil	Nil	3/3	...	—
Callender's	69/–	57/–	20	15	57/6	...	5 4 4
Chloride Elec. Storage	72/6	68/–	20	15	3½	...	4 5 9
Consolidated Signal	72/6	59/–	36½	17	3⅝	...	4 13 10
Crabtree (10/–)	24/9	21/–	17½	17½	21/3	–2/6	8 4 9
Crompton Parkinson:							
Ord. (5/–)	20/–	13/6	15	20	13/9	–½	7 5 6
E. K. Cole (5/–)	5/–	3/3	10	Nil	4/–	...	—
Elec. & Musical Industries (10/–)	10/3	5/6	5	Nil	6/–	–6d.	—
Electric Construction	36/3	32/6	12½	13½	35/–	...	7 14 2
Enfield Cable Ord.	56/–	46/3	25	16½	48/9	...	6 13 2
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	...	5 0 0
English Electric	33/9	26/–	10	10	26/3	–¼	7 12 4
Ensign Lamps (5/–)	15/3	13/9	25	25	13/9	...	9 1 10
Ericsson Tel. (5/–)	39/3	30/–	25*	25*	30/–	...	4 3 4
Ever Ready (5/–)	28/3	20/3	30	40	20/6	–1/–	9 15 2
Falk Stadelmann	18/3	17/6	10	6	17/6	...	6 17 4
Ferranti Pref.	25/–	23/–	7	7	25/–	...	5 12 0
G.E.C.:							
Pref.	32/6	28/–	6½	6½	29/6	...	4 8 3
Ord.	83/3	73/6	17½	20	73/9	–2/3	5 8 3
Greenwood & Batley	25/6	23/6	15	15	23/9	...	12 12 8
Hall Telephone (10/–)	18/6	15/–	15	10	15/–	...	6 13 4
Henley's (5/–)	21/6	16/3	20	20	16/3xd.	–9d.	6 3 1
4½% Pref.	21/3	20/6	4½	4½	21/3	...	4 4 8
Hopkinsons	46/9	40/–	12½	15	40/–	–½	7 10 0
India-Rubber Pref.	21/–	20/–	5½	5½	20/9	...	5 6 0
Intl. Combustion	121/3	100/–	32½	32½	5	–⅜	6 10 0
J. Lucas	60/6	53/3	15	15	56/3	–⅛	5 6 10
Johnson & Phillips	50/9	40/–	12½	15	40/–	–1/6	7 10 0
Lancashire Dynamo	59/9	53/–	25	20	55/–	...	7 5 6
Laurence Scott (5/–)	11/–	9/3	15	15	9/6	...	7 17 10
London Elec. Wire	25/6	25/–	12	7½	25/–	...	6 0 0
Mather & Platt	46/6	36/3	13½	10	37/6	...	5 6 7
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	...	5 3 6
Murex	86/9	70/–	20	20	70/–	–⅝	5 14 3
Pye Deferred (5/–)	9/–	7/–	25	25	9/–	...	13 17 9
Revo (10/–)	20/9	16/3	17½	17½	17/6	...	10 0 0
Reyrolle	60/6	50/–	12½	12½	50/–	–⅝	5 0 0
Siemens Ord.	23/9	17/3	7½	7½	17/6	–⅛	8 11 6
Strand Elec. (5/–)	2/3	1/9	10	4	2/–	...	10 0 0
S. Smith (1/–)	8/–	6/–	37½	50	6/3	–⅛	8 0 0
Switchgear & Cowans (5/–)	11/9	7/6	20	10	10/–	...	5 0 0
Telegraph Condenser (10/–)	8/9	6/3	5	—	8/9	...	—
Telegraph Construction	42/6	32/6	10	10	35/–	–½	5 14 3
Telephone Mfg. (5/–)	9/–	7/–	9	9	7/–	–6d.	6 8 7
Tube Investments	96/9	82/–	23½	23½	4½	–½	5 16 4
Vactric (5/–)	3/6	2/–	4	Nil	3/–	—3d.	—
Vickers (10/–)	22/–	12/–	10	10	12/3	–2/–	8 3 4
Ward & Goldstone (5/–)	19/9	19/3	20	20	19/9	...	5 1 3
Westinghouse Brake	46/–	32/9	17½	10	40/–	...	5 0 0
Walsall Conduits (4/–)	26/6	23/9	55	55	23/9	–½	9 5 2
West, Allen (5/–)	7/–	5/–	10	7½	5/–	...	7 10 0

* Dividends are paid freeof Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Australia. — MELBOURNE. — June 25th. State Electricity Commission of Victoria. Cable. (T. 19609/40.)*

General service AC kWh meters for twelve months. (T. 19859/40.)*

July 23rd. Voltage regulating equipment. (T. 19531/40.)*

June 18th. Posts and Telegraphs Department. Line finder equipment. (T. 19215/40.)*

July 4th. Trunk type cable. (T. 19216/40.)*

July 16th. Underground cable. (T. 19853/40.)*

August 6th. Transformers for Kiewa No. 3 power station. (T. 19912/40.)*

Barking. — June 28th. Corporation. Electrical work at first-aid post and control centre, new Town Hall. (See this issue.)

Beckenham.—June 10th. Electricity Department. Coal supply. (May 24th.)

Brighouse.—June 15th. Electricity Department. One 350-kVA transformer. (See this issue.)

Burnley. — June 17th. Corporation. Extra-high-voltage switchgear and cables. (May 31st.)

Bury.—June 17th. Electricity Department. Supply, delivery, laying and jointing of 11-kV cable; one 5,000-kVA transformer. (May 31st.)

Dunfermline.—June 10th. Scottish Special Housing Association, Ltd. Various works, including electric lighting, at Brucefield housing scheme (100 houses). Schedules from N. J. Campbell, secretary, 11, Drumsheugh Gardens, Edinburgh, 3, to whom tenders are to be sent.

Glasgow.—June 8th. Clyde Navigation Trust. Stores, including electrical. Stores superintendent, No. 1 Graving Dock, Govan.

Heywood.—June 17th. Electricity Department. Supply, delivery, laying and jointing of 11-kV cables, supply and connecting up one 5,000-kVA transformer, and 11- and 66-kV switchgear. (May 31st.)

Newark-on-Trent.—June 15th. Electricity Department. 11-kV metal-clad ring main unit and a 50-kVA transformer. (May 24th.)

New Zealand. — WELLINGTON. — June 25th. Public Works Department. Suspension insulators. (T. 19809/40.)*

Portsmouth.—Electricity Department. Supply and erection of one earthing resistance upon a 22-kV system. (See this issue.)

South Africa. — JOHANNESBURG. — City Council. July 10th. Ten l.v. switchboards. (T. 19395/40.)*

Ten 250-MVA and fourteen 150-MVA, triple-pole, oil-immersed circuit-breakers for use on a 6,600-V, 50-cycle system. (T. 20003/40.)* Box-type distribution fuse units. (T. 20005/40.)*

Distribution transformers. (T. 19831/40.)*

July 11th. Public Works Department. Electric body lift at the new Police Mortuary, Johannesburg. (T. 20009/40.)*

June 12th. Electricity meters (house-service type.) (T. 19797/40.)*

June 15th. Twenty-three miles of extra-high-voltage and forty-one miles of low-voltage p.i. cables and three miles of combined 4-core unscreened pilot and 3-pair telephone cables. (T. 20001/40.)*

July 15th. Railways and Harbour Administration. Electrical equipment, comprising high-speed circuit-breakers, isolating links, insulators, &c., and battery charging equipment. (T. 19785/40.)*

CAPE TOWN.—July 3rd. Electricity Department. Secondary battery and battery charging equipment. (T. 19635/40.)*

PORT ELIZABETH.—June 20th. Battery-driven tower wagon and l.v. cable. (T. 19657/40.)*

SALISBURY (SOUTHERN RHODESIA).—July 15th. Electricity Department. Electrical distribution materials. (T. 19595/40.)*

Stourbridge.—June 8th. Upper Stour Valley Main Sewerage Board. Periodical examination and testing of electrically operated pumping plant at sewage pumping stations. Particulars from the Board's engineer, G. P. Deeley, 13, Church Street.

West Riding.—June 12th. County Council. Automatic telephone installation in the Knaresborough Institution. Specifications from the acting county architect, County Hall, Wakefield.

Contracts Closed

Barking.—Electricity Committee. Accepted. For supply to Chemical Supply Co.: High-voltage switchgear (£747).—A. Reyrolle & Co. Medium-voltage switchgear (£123).—W. Lucy & Co. For supply to Cape Asbestos substation: High-voltage switchgear (£1,757).—A. Reyrolle & Co. Medium-voltage switchgear (£732).—J. G. Statter & Co.

Birkenhead. — Electricity Committee. Accepted. Wiring under assisted scheme. —J. J. Peters (£175); J. Heaney & Co. (£34); S. George (£31).

Birmingham. — Town Council. Accepted. Pressure test transformer and induction regulator at Hams Hall "A" power station.—Ferranti. High-pressure steam and drain pipework, valves, &c., at Hams Hall "B" power station.—Stewarts & Lloyds.

Salvage Department. Accepted. Electric vehicle batteries for the year ending March 31st, 1941.—D.P. Battery Co.; Chloride Electrical Storage Co.; Britannia Batteries.

Cheltenham. — Electricity Committee. Accepted. Cable contract for a further twelve months.—Hackbridge Cable Co.

Hereford.—Health Committee. Accepted. Electrical installation at Hospital Lodge and Mortuary.—C. F. Roberts.

Heston and Isleworth.—Town Council. Accepted. Two electrically propelled refuse collection vehicles (£1,350).—Eagle Engineering Co.

Liverpool.—Mersey Docks and Harbour Board. Accepted. Electric cable.—Liverpool Electric Cable Co.

(*Continued on page* 628.)

Electrical Imports of Ceylon

British Share Maintained

CEYLON'S electrical imports last year, after having been swollen in 1938 by increases in the telephone and telegraph groups, went back to their 1937 level, the total value standing at Rs. 3,236,000. There were noteworthy declines not only in telegraph and telephone instruments (other than radio) but also in wires and cables and unspecified apparatus. The share of the United Kingdom in the trade generally was well maintained.

The improvement in the markets for rubber and tea has strengthened the economic situation generally, especially as panicky buying soon came to an end. Trade in coconut produce has, however, been below expectations, and another rather depressing factor is discontent among the Indian labourers. (Rupee=about 1s. 6d.).

	1939 Rs. (000)	Inc. or dec. on 1938 Rs. (000)
Control and switchgear—		
Total*	148	+ 10
Radio instruments and apparatus—		
Total	307	+ 51
From United Kingdom	162	+ 30
„ Germany	14	− 14
„ Holland	52	+ 17
„ United States	69	+ 13
Other telegraph and telephone instruments—		
Total*	453	−782
Lighting accessories, fittings and switches—		
Total	184	− 53
From United Kingdom	88	− 23
„ Germany	43	+ 16
„ Japan	6	—
„ United States	8	+ 4
„ Hong-Kong	28	− 49
Batteries, dry, radio—		
Total	12	− 5
From United Kingdom	7	− 4
„ United States	1	− 1
„ Denmark	3	+ 3
Batteries, dry, other—		
Total	465	+ 43
From United Kingdom	12	− 17
„ India	13	+ 11
„ Hong-Kong	249	+ 18
„ Germany	28	+ 10
„ United States	163	+ 23
Other batteries and accumulators—		
Total	47	+ 10
From United Kingdom	29	− 3
„ Germany	14	+ 14
Electrical goods and apparatus not elsewhere specified—		
Total	386	−100
From United Kingdom	308	− 72
„ Germany	28	+ 11
„ Japan	8	—
„ United States	27	− 37
Transformers and convertors—		
Total*	108	+ 30
Generators and alternators—		
Total*	127	+ 5
Motors—		
Total	68	—
From United Kingdom	63	+ 3
„ United States	4	—
Electrical machinery not elsewhere specified—		
Total	324	+160
From United Kingdom	290	+171
„ Germany	8	− 3
„ Italy	8	− 2
„ United States	14	− 6
Rubber-insulated wires and cables—		
Total	134	− 56
From United Kingdom	113	− 44
„ Germany	20	− 9
Other electric wires and cables—		
Total	268	−114
From United Kingdom	263	−112
„ Germany	2	—
Lamps, gas-filled—		
Total	84	− 2
From United Kingdom	73	+ 1
„ Germany	5	− 2
Electric lamps, other—		
Total	63	+ 7
From United Kingdom	50	+ 7
„ Japan	6	+ 2
Torch bulbs—		
Total	58	+ 14
From Japan	3	− 10
„ United States	2	− 17
„ Hong-Kong	31	+ 31
„ United Kingdom	19	+ 8

* Mainly from United Kingdom.

Mansfield. — Electricity Committee. Accepted. 300-kVA transformer (£243).—British Electric Transformer Co. Three 200-kVA and one 100-kVA transformers (£677).—Brush Electrical Engineering Co.

Middleton.—Electricity Committee. Accepted. Cable required for feeder for the bulk supply.—Scottish Cables.

Newark (Notts).—Town Council. Accepted. Cable and two six-way feeder pillars.—B.I. Cables.

Sheffield. — Health Committee. Accepted. Three dustless refuse collecting vehicles.—Electricars.

Watch Committee. Accepted. Apparatus for radiating wireless messages to police stations and vehicles (£2,450).—G.E.C.

Electricity Committee. Accepted. Installation of coal storage and reclamation plant at Blackburn Meadows power station (£51,349).—Mitchell Engineering. Switch panel (£4,051).—A. Reyrolle & Co.

Southend-on-Sea.—Electricity Committee. Accepted. 700 cooker plates.—G.E.C

Stoke-on-Trent.—Electricity Committee. Accepted. Overhead transmission lines.—Callender's.

Taunton.—Electricity Committee. Accepted. Transformers for twelve months.—Ferranti.

West Ham.—Borough Council. Accepted. Two electrically operated passenger lifts and two goods lifts at the new ward block extensions at Whipps Cross Hospital.—Marryat and Scott.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aireborough. — Bus station, White Cross, Guiseley, for U.D.C.; surveyor, Town Hall, Guiseley.

Amersham.—Fire station, Buckland Common, for R.D.C.; surveyor, Council Offices.

Berkshire.—Hostels, for C.C.; county architect, Shire Hall, Reading.

Berwick.—Boilerhouse for Tweedside Co-operative Society; Gray and Paterson, architects, 11, Castlegate, Berwick.

Additions, Thatch House Tavern, for Berwick Breweries; G. Reavell, architect, Alnwick.

Blackpool.—Erection of new Clarence Hotel, Rosemead; Halstead Best, architect, 20, Clifton Street.

Brighouse.—Additions to Calder Dyeworks, Birds Royd, for Beacon Dyeing Co., Ltd.

Bury.—Combined clinic and first-aid post, Thrush Drive; borough engineer.

Carlisle.—Operating theatre, Cumberland Infirmary, for the Management Committee; J. and R. Bell, builders, Nelson Street, Carlisle.

Public shelters on four sites and shelters for new Central Schools, for the City Council ; city engineer, 18, Fisher Street, Carlisle.

Cornwall.—Hospital, West Cornwall, for Public Health Committee; county architect, County Hall, Truro.

Coventry.—Extensions to factory, Burnsall Road, for R. R. Fairlie, Ashleigh, Birmingham Road.

Dalton-le-Dale. — Church hall; Rev. W. H. Walton, Dalton-le-Dale, vicar.

Dudley.—Extensions to Dudley and Staffordshire Technical College, Broadway; A. J. Crump & Sons, Ltd., builders, Aston Road, Dudley.

Dundee.—Workshop, Balgray Place, for Urquhart Lindsay and Robertson Orchar, Ltd.

First-aid centre, Lower Pleasance, for the Victoria Spinning Co.

Dunmow.—Canteen and clubroom, Felstead Factory, for British Sugar Beet Corporation, Ltd.

Durham.—First-aid post at Egglescliffe; county architect, 43, Old Elvet, Durham.

Ealing.—Alterations and addition of kitchen and nurses' quarters, Green Lane, for Hanwell Cottage Hospital; Dodge and Reid, architects, 72, High Street, Brentford.

Eire.—CORK.—Temporary building at Cork Mental Hospital (general contractor will be responsible for subcontracts, including heating and electric lighting); O'Connell and Harley, surveyors, 6, South Mall, Cork.

WEXFORD.—National school, Wexford; F. D. Shortall, surveyor, 10, Leinster Street, Dublin.

Faringdon.—Pump-house at Wicklesham Borehole; K. M. Hart, engineer, Rural District Council Offices, London Street, Faringdon, Berks.

Finchley.—Cleansing station, Central depôt (£2,035) ; E. S. Moss, Ltd., 159, Brent Street, N.W.4.

Hanley.—Food stores, Broad Street; W. S. Brown & Sons, Ltd.

Hinckley.—Extension to factory, Rugby Road; C. Simpson, Ltd.

Factory additions, Hawley Road; Hood and Mason, Ltd.

Dairy additions, Hollycroft; A. Hardy & Sons.

Yarn shed, Hinckley Road, Burbage; A. Harding & Co.

Liverpool.—Warehouse, Vulcan Street, for Bouts-Tillotson Transport, Ltd., Waterden Road, London, E.15; A. Pickles, architect, 3, Wards End, Halifax.

Store building, including A.R.P. shelter, 33, Carruthers Street, for Lasco, Ltd.; F. O. Lawrence, architect, Bank Chambers, 3, Cook Street.

Store building extension, Rice Lane, for Dunlop Rubber Co., Ltd., Fort Dunlop, Erdington, Birmingham, 24.

Additions to welfare department, Dryden Road, for Wm. Crawford & Sons, Ltd., Binns Road; G. H. Crawford, architect.

Central hall and school building, Childwall Valley Road, for S. S. Robinson; K. Cameron, architect, 64, Rodney Street.

Workshop and store, Speke Church Road, for Highways Department; borough engineer.

Reinstatement after fire, 32, Hope Street, for J. Hunter & Sons; Badge and Hutton, architects, 34, Castle Street.

London. — (SOUTHWARK). — Factory, 14-15, Massinger Street; P. H. Clarke & Son.

Lytham St. Annes.—Workshop, Squires Gate Goods Yard, for Blackpool Rope and Twine Co.

Merioneth.—Alterations and additions to the County School, Barmouth; N. L. Jones, county architect, County Offices, Dolgelley, North Wales.

Middlesbrough.—Additions, Tollesby Road, for J. E. Eccles; H. C. Garbutt, architect, 18, Albert Road, Middlesbrough.

Several basement shelters to be equipped with electricity; plans by H. Haigh, borough electrical engineer.

Middlesex.—Sewage works, Enfield and Edmonton (£123,000); county surveyor, Great George Street, S.W.1.

Morecambe.—Flats, Lancaster Road; H. Vickers.

Morpeth.—Completion of 106 houses, Widdrington Station, for R.D.C.; T. T. Watson, surveyor, Council Offices.

Newcastle (STAFFS).—Conversion of premises into covered market, for T. W. Carryer & Co., Cheapside; Hollins and Jones, architects, Lloyds Bank Chambers.

Newcastle-on-Tyne. — Conversion of part of Elswick Grange to emergency hospital for City Council; H. Kindred, builder, 145, West Road.

Shelters at schools:—Walker R.C.: Elliott Brothers, builders, Otterburn Terrace, Newcastle. St. Lawrence's and St. Dominic's: J. and W. Lowry, builders, Corporation Street, Newcastle. St. Aloysius: H. Kindred, builder, 145, West Road, Newcastle.

Nottingham. — Additional storey at Nurses' Home, Standard Hill, for General Hospital House Committee; secretary.

Old Fletton.—Store and extension to vegetable cannery, Carlton Mills; J. Farrow and Co., Ltd.

Oxford.—Factory extension, Garsington Road, for Pressed Steel Co., Ltd.; C. Howard Crane.

Bakery, 33, Cowley Road; E. Allan.

Romsey and Stockbridge.—Fire station, Stockbridge, for R.D.C.; surveyor, Council Offices, Duttons Road, Romsey.

Rossendale (LANCS). — Reconstruction of Whitewell Works, Waterfoot; Henry Trickett & Son, Ltd., contractors, Turton Hollow, Crawshawbooth, Rossendale.

St. Albans.—Pumping station, for R.D.C.; D. Balfour & Sons, engineers, 9, Stone Road, Bromley, Kent.

Seaton Valley (NORTHUMBERLAND).—Houses (30), at Hester Hill, Klondyke and Seghill, for R.D.C.; surveyor, Council Offices, Seaton Delaval.

Sheffield.—Works extensions and air-raid shelters, Archer Road, Millhouses, for Sheffield and Ecclesall Co-operative Society, Ltd., The Arcade, Ecclesall Road; Thomas Wilkinson & Sons (Builders), Ltd., contractors, Olive Grove Works.

Southport. — Tuberculosis pavilion, New Hall Hospital, Scarisbrick (£9,790), for T.C.; W. & P. Knowles, Ltd., contractors, 10, Bradshawgate, Bolton.

South Shields (Co. DURHAM).—Shelters, St. Peter and St. Paul School (£1,000); A. G. Richardson, acting borough surveyor, Town Hall.

Stockport.—Alterations and improvements, "Railway Hotel," Gorton Road, Reddish, for the Threlfalls Brewery Co., Ltd., Cook Street Brewery, Salford; B. Waterhouse, architect, 134, Deansgate, Manchester.

Alterations and improvements, "Hollywood Hotel," Bloom Street, for the Manchester Brewery Co., Ltd., Woodside Brewery, Eccles New Road, Salford; company's architects' department.

Stoke-on-Trent. — Additions, London Road Works, for Biltons, Ltd.

Cleansing station, Booth Street (£2,270); G. & J. Seddon, Ltd.

Stretford.—Extension, cable shop, Trafford Park Road; W. T. Glover and Co., Ltd.

Sutton Coldfield.—Fire station, Anchorage site; borough engineer.

Todmorden.—Alterations to premises, Halifax Road, for branch offices for Britannic Assurance Co., Ltd., Broad Street Corner, Birmingham; Lear & Heywood, Ltd., contractors, Law Lane, Castleton, near Rochdale.

Totnes.—Mill, Winsland, for Torbay Mill Co., Paignton; S. Thomson, architect, 42, Kensington Mansions, S.W.7.

Tottenham.—Factory extensions, Lawrence Road; Cronite Foundry Co., Ltd.

Factory and stores, Ashley Road; Cannon Rubber Manufacturers, Ltd.

Additions, St. Ann's Works, Warwick Gardens; Ever Ready Co. (Gt. Britain), Ltd.

Tynemouth.—Shelter, Priory School, for E.C.

Sub-station, Chirton Lane, for Northern Rediffusion, Ltd., Blackett Street, Newcastle-on-Tyne.

Air-raid shelter at the Victoria Jubilee Infirmary; Hastie D. Burton, Ltd., builders, King Street, North Shields.

Uttoxeter. — Agricultural workers' dwellings, for R.D.C.; C. E. Ingham, surveyor, Council Offices.

Wallsend-on-Tyne. — Conversion of clinic, Vine Street, to mortuary, for T.C.; J. A. Blench, borough engineer, Town Hall.

West Hartlepool.—Alterations, Lynn Road, for Montague Burton, Ltd., Leeds.

Wetherby (YORKS).—Conversion of old chapel to fire station for R.D.C.; surveyor, Council Offices, Wetherby.

Whaley Bridge. — Houses, Jodrell Road; S. Drinkwater & Son, builders, Canal Street.

Willesden.—Public shelters, for B.C.; F. Wayman Brown, borough engineer, Town Hall, N.W.6.

York.—Technical College, for E.C.

Trade Mark Applications

AMONG recent applications for British trade marks are the following, objections against any of which may be entered within one month from May 29th:—

Lœwe Radio. No. 606986. Class 9 (IV). Wireless telephonic, telegraphic, television and optical telegraphic apparatus and parts thereof.—Lœwe Radio Co., Ltd., 3-4, Clements Inn, London, W.C.2.

Atlas. No. 610675. Class 9 (IV). Radio and television sets.—Atlas Radio, Ltd., 105, Judd Street, London, W.C.1.

Seco. No. 606241. Class 11 (IV). Electric cooking stoves, water softening apparatus, electric refrigerators, &c.—Sterling Engineering Co., Ltd., Sterling Works, High Road, Dagenham, Essex.